GEK-49265

TermiNet*

310/320/330/340
LINE PRINTERS

Electronic Services - Los Angeles
M14754X

SERVICE MANUAL

GENERAL ELECTRIC

*Trademark, General Electric Company, USA

The information contained herein does not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to General Electric Company, USA.

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TermiNet DATA COMMUNICATION PRODUCTS

TermiNet 310/320/330/340 Line Printers

Service Manual - GEK-49265

Printed February, 1976

PREFACE

This manual provides service instructions for the TermiNet 340 Family of Line Printers including the Model 310, 320, 330 and 340. Basic differences between the four models are pointed out where appropriate. Additional information regarding operation and service of these Line Printers may be obtained from the publications listed below.

Operation

TermiNet 310/320/330/340 Line Printer Operator's Manual GEK-49264

Service

TermiNet 310/320/330/340 Line Printer Installation Manual. GEK-49263

TermiNet 310/320/330/340 Line Printer Parts Manual GEK-49266

Line Printer Service Drawings GEZ-5785

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CHAPTER 1

INTRODUCTION

GENERAL DESCRIPTION

The TermiNet 340 Family of Line Printers (the TermiNet 340 Line Printer is illustrated in Figure 1-1) is designed to provide the Line Printer function in data communication systems. This Printer family uses the USASCII data communications code to print up to 340 lines of data per minute, depending upon which model in the family is being employed.

This manual is written to cover servicing of all of the models in the TermiNet 340 Family of Line Printers (i.e., models 310, 320, 330, and 340). The term TermiNet 340 Line Printer is used throughout this manual to refer to all of the models.

The main difference which exists in the various Line Printer models is the lines per minute speed at which they operate. Any other differences which exist are discussed where applicable.

Printer design is primarily electronic, with a minimum number of moving parts. The logic rack is installed in a Pedestal mounted bustle with the main power componenets located within the Printer frame. The TermiNet 340 Line Printer prints out on a single or multiple part, continuous pin feed, edge punched paper.

PRINT MECHANISM

The Printer uses a belt printing concept to achieve its high speed and reliability. A belt carrying print fingers rotates horizontally past a bank of hammers. Each finger has a type character or symbol embossed on the upper end. There are two complete sets of characters (type fonts) on the belt. An optional three font print belt is also available.

Printing takes place by firing a hammer at the correct time to hit the selected print finger to be printed. The

PLH-5004

Figure 1-1. TermiNet 340 Line Printer

print finger is driven against the ribbon and paper to accomplish the printing process. The print finger and hammer rebound back to their correct positions after contacting the platen.

PRINTER SYNCHRONIZATION

Precise synchronization permits the belt printing concept to work. The Printer's electronics compares the positions of the print fingers in front of the hammers. The hammer is fired when the selected print finger is in the correct position. Timing and synchronization of the comparison process is maintained by means of timing pulses. Timing pulses are generated as each print finger passess a photocell; thus, the control logic is continuously informed of the position of the print fingers with respect to the hammers.

ELECTRONIC LOGIC MODULE

The main electronic logic module (bustle) is mounted in the Printer Pedestal. The bustle contains large-scale integrated circuits on printed circuit boards to provide the necessary circuits for Printer operation. The printed circuit boards are designed for interchangeability to keep maintenance and service to a minimum. The logic circuits are designed so that most of the basic functions are on one printed circuit board. The function of certain printed circuit boards can be changed by changing wire straps (see Strapping Options, Chapter 5 - Troubleshooting).

In addition to the pedestal mounted electronic module (bustle), the Printer contains one additional printed circuit board located on the main frame of the Printer. This board provides the power control for the Printer and is located under the top cover above the power transformer assembly.

SPECIFICATIONS

CODE COMPLIANCE

The TermiNet 340 Line Printer conforms to the standard seven bit USASCII code with the eight bit reserved for parity (optional). This code is illustrated in Figure 1-2.

b_7 b_6 b_5 → / Bits					0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
b_4	b_3	b_2	b_1	Column → / Row ↓	0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	10	LF	SUB	*	:	J	Z	j	z
1	0	1	1	11	VT	ESC	+	;	K	[	k	{
1	1	0	0	12	FF	FS	,	<	L	\	l	¦
1	1	0	1	13	CR	GS	-	=	M	]	m	}
1	1	1	0	14	SO	RS	.	>	N	^	n	~
1	1	1	1	15	SI	US	/	?	O	_	o	DEL

MSC-3002

Figure 1-2. American Standard Code for Information Interchange (ASCII) Code Chart

SIZE AND WEIGHT

Dimensions and weight of the TermiNet 340 Line Printer are as follows:

Width	26.14 in	(66.4 cm)
Depth (w/o Paper Rack):	21.54 in	(54.7 cm)
Depth (incl. Paper Rack):	29.32 in	(74.2 cm)
Depth (incl. Optional Paper Shelf):	35.47 in	(90.1 cm)
Depth (w/Optional Paper Shelf at Max. Ext.)	37.97 in	(96.4 cm)
Height (w/o Paper Rack):	36.16 in	(91.8 cm)
Height (incl. Paper Rack):	37.80 in	(96.0 cm)
Height (with top open):	48.39 in	(122.9 cm)
Weight (approximate)	135 lbs.	(61.2 kg)

ENVIRONMENT

Avoid installing the Printer in hot, humid, or dusty areas.

Environmental specifications are as follows:

Temperature

Operating: +32°F (0°C) to +110°F (43.5°C)
Storage: -20°F (-29°C) to + 160°F (71°C)

Relative Humidity

Operating: 10% to 95° non-condensing
Storage: 10% to 95° non-condensing

Altitude

Operating: 0 to 12000 feet (3660 m)
Non-operating: 0 to 50000 feet (15,260 m)

INPUT POWER

117 ± 10% VAC, single phase, 50 or 60 Hz. Nominal power consumption is:

Standby - 90 Watts nominal
Printing - 350 Watts nominal

PRINT LINE LENGTH AND PRINTING SPEED

The chart shown below details typical printing line lengths and speeds of the various models of the TermiNet 340 Family of Line Printers.

Table 1-1
Printing Speeds

LINE PRINTER MODEL	PRINT BELT FONT	LINES PER MINUTE PRINTING SPEED			
		80 COLUMN LINE LENGTH		132 COLUMN LINE LENGTH	
		MINIMUM	MAXIMUM*	MINIMUM	MAXIMUM*
310	2	150	185	90	130
320	2	190	240	115	170
330	2	190	240	180	240
340	2	190	240	230	240
310	3	150	185	90	130
320	3	190	235	115	170
330	3	300	340	180	265
340	3	340	340	230	340

*Maximum values are based on a line density (characters per line) of 64 for an 80 column print out, and 90 for a 132 column print out. The minimum values are based on a line density of 80 and 132 characters per line respectively.

PAPER HANDLING

Paper is supplied to the Printer from a box or tray located at the front of the Printer containing continuous folded sheets or multi-form sets. The Printers have an adjustable paper tractor for use with individual form sets or other standard edge punched paper. The Printer will handle paper up to 15.00 inches (38.1 cm) wide. Form sets consisting of up to six parts having a maximum thickness of 0.025 inches (0.64 mm) may be accommodated.

NOTE

Single ply Paper may also be fed to the Printer from the rear.

DATA INTERFACE

Data is transferred bit parallel, character serial to the Printer from the data source through a twenty-five pin connector.

PRINT CHARACTER SET

The standard two font print belt contains two character sets consisting of the 94 print characters defined in the USASCII set (less control codes), including both upper and lower case alphabet.

A 96 character print set is standard; an optional strap on the Logic (LOG) PWB can be set to allow only upper case printing. When printing upper case only, all lower case character input codes are converted to upper case.

The optional three font print belt contains three character sets consisting of 64 print characters (excluding lower case alphabet).

PRINT CONTROL

The buffer print memory is loaded at a rate determined by the data source driving the Printer's interface.

A READY signal from the Printer permits the data transfer cycle. The data transfer is terminated by a control signal from the data-source to the Printer. The transfer can also be terminated by the Printer when a full line of data has been received. Data transfer is expected to require no more than the 25 millisecond line feed period. However, if the data source is slow, a longer transfer period can be accommodated with the resulting reduction in print rate. Printing of the line begins at the completion of the data transfer cycle.

A low belt speed sensor started by the MOTOR ON command prevents printing while the print belt is accelerated up to speed.

CHARACTER SPACING

Horizontal, 10 characters per inch.

LINE SPACING

6 lines per inch.

PARITY

Straps are provided on the INT board to set the Printer logic to check the incoming data for even, odd, or no parity. A parity error symbol will be printed when a parity error is detected.

VERTICAL FORMAT UNIT (VFU) OPTION

The TermiNet 340 Line Printer is available with the paper tape VFU option to provide automatic vertical line spacing on preprinted forms. The VFU option uses a standard one-inch wide, eight-channel paper tape with 1/10 inch pitch sprocket holes between channels 3 and 4.

PAPER SLEWING

Whether or not the VFU option is installed, paper can be slewed by appropriate commands from the data source at a rate of 8.2 inches per second.

The first character of a data transfer cycle is for paper control and will not be counted as a print character. If bit seven of the paper control character is a logic one, then the six lower bits determine the number of lines that paper will slew (0 to 63). If bit seven is a logic zero, then bit six will determine whether the Vertical Format Unit (if installed) will execute a form feed or a vertical tab.

RIBBON CARTRIDGE

Due to the heavy printing demands placed on the TermiNet 340 Line Printer, it is equipped with a replaceable ink ribbon cartridge. Whenever ribbon replacement becomes necessary, the entire cartridge may be easily replaced with a fresh unit.

The ink ribbon cartridge contains a 1.00 inch wide continuous loop of ribbon configured as a Mobius strip. This configuration allows complete use of the entire ribbon area:

MODEL NUMBER

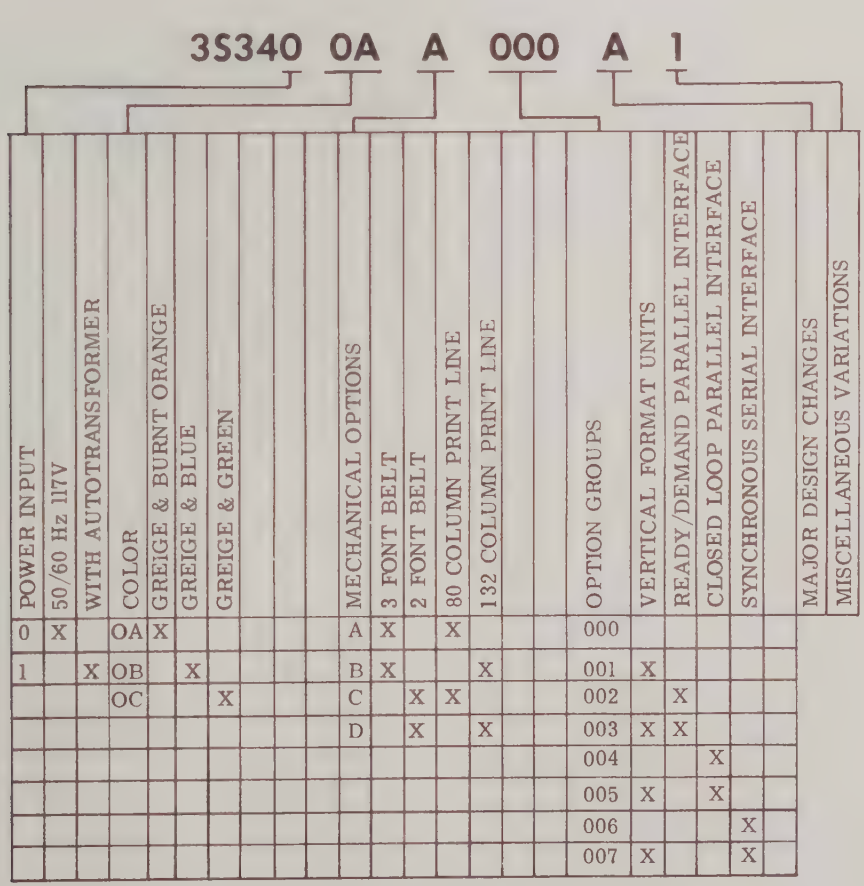
The model number of the Printer is coded to indicate model and options. Figure 1-3 is a chart that illustrates how to interpret the code.

For example, Printer model number S3400AA000A1 would describe a TermiNet 340 Printer as having 80 print columns, and designed to be used with 60 Hz 120V input power. The "000" in the model number represents a particular group of options installed on the Printer at the factory. Finally, the A1 in the model number represents model changes and variations within each model change.

SERIAL NUMBER

The nameplate on the Printer frame shows both model number and serial number. The serial number is a ten digit number broken down as follows:

First two digits - year of manufacture.
Second two digits - fiscal week of manufacture.
Fifth digit - equipment type.
Last five digits - manufacturing sequence number.



PLH-5001

Figure 1-3. TermiNet 340 Line Printer Model Number Code Chart
(Models 310, 320 and 330 Excluded From This Chart)

CHAPTER 2

INSTALLATION AND CHECKOUT

SECTION 1

INSTALLATION

PREPARATION FOR INSTALLATION

OPERATING AREA PREPARATION

Arrange in advance an appropriate location for the TermiNet 340 Line Printer. A floor area about four feet wide and three feet deep is required to permit cleaning, ventilation, and access to paper handling racks and trays.

NOTE

Other pertinent information may be obtained by reading the Data Communication Products Department brochure "Customer Preparation for TermiNet Printer" (DCP-1110) before installation.

POWER SUPPLY

The standard TermiNet 340 Line Printer requires 117 volts (±10%), 50/60 Hz (+1, 1 -1/2 Hz). (The Printer is designed for both 50 and 60 Hz operation.) The Printer nominal power ratings are 90 watts Standby, and 350 watts printing. The Printer power cable is 8 feet (2.44 m) long, three-conductor, with attached grounding type lug.

An AC power outlet supplying correct voltage, current, and frequency must be available within six feet (1.83 m) of the Printer. This AC power source must be properly grounded in accordance with recognized good safety practices. In addition to personnel safety considerations, an AC power source not grounded in accordance with recognized good safety practices may cause erroneous equipment operation and could result in damage to the equipment.

NOTE

Read Model Number nameplate on specific equipment (see Chapter 1 for Model and Options coding). Some optional special models operate at different voltages and frequencies.

Also avoid using circuits serving other devices which may cause chronic low voltage and introduce "noise", and circuits with heavy equipment whose starting may cause voltage dips and fluctuations.

SYSTEM COMAPTIBILITY

Before installation, check that interfacing equipment (computer, parallel interface lines, etc.) is compatible with the TermiNet 340 Line Printer.

EXPENDABLE SUPPLIES

A supply of fuses, ribbon cartridges, paper, forms, and other expendables should be kept on hand by the customer. Detailed information on expendable items is provided in "Ordering Supplies for your New TermiNet Data Communication Equipment" (GEJ-2748). This brochure is included in the shipping package.

NOTE

Spare parts, ribbon cartridges, and non-standard items which are supplied by General Electric Company may be ordered from:

Data Communication Products Department
Parts Administration Unit
General Electric Company
Waynesboro, Virginia 22980

UNPACKING

SHIPPING MATERIAL

The Printer and pedestal are packaged in one shipping carton, together with the seperately boxed paper handling equipment and its mounting hardware sealed in plastic over cardboard. The ribbon cartridge is also included in the Printer shipping carton. The Printer is protected against shipping damage by a form fitting foam cover. A Documentation Instruc-

tion Package is included for customer use. This package contains pertinent manuals for installation and operation of Printer and included options.

If any shipping or handling damage is found upon delivery or during unpacking, immediately notify carrier. If any equipment is missing or incorrect, notify General Electric Company, Data Communication Products Department, Waynesboro, Virginia 22980 (Telephone: (703) 942-8161).

UNPACKING INSTRUCTIONS

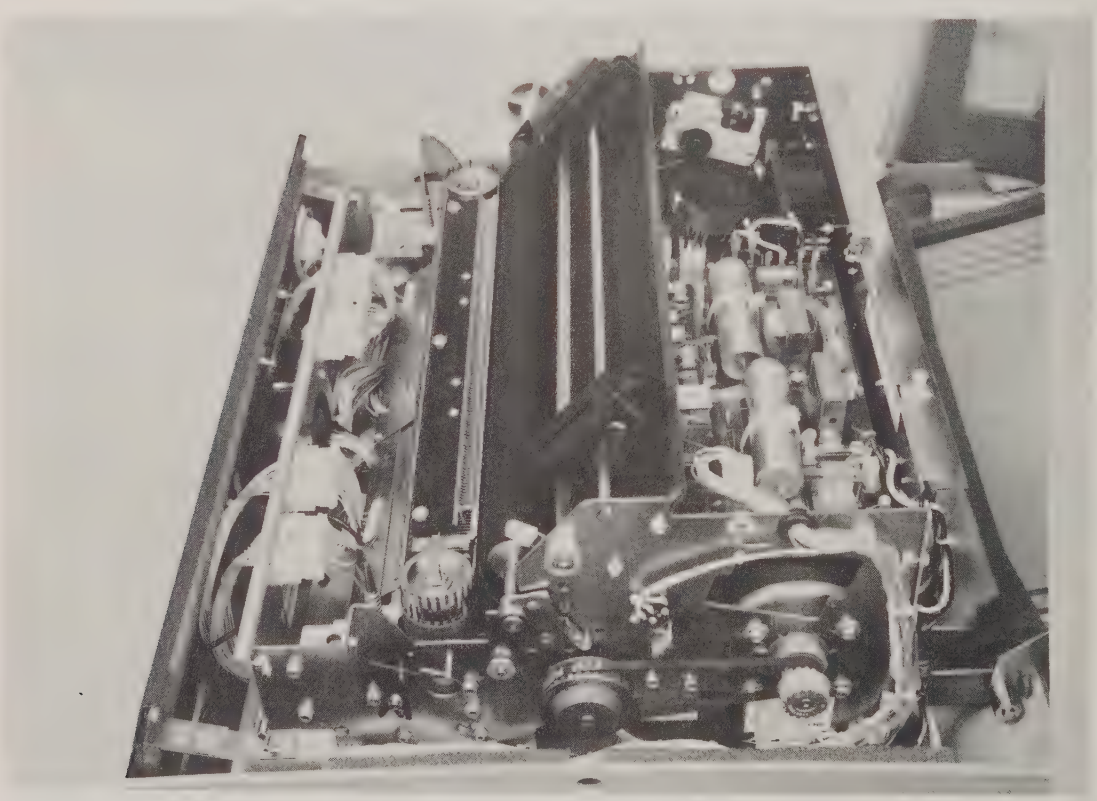
NOTE

Retain shipping carton and packing material for use in reshipping Printer.

1. With shipping carton right side up, cut banding straps around outer carton and lift off top end cap of shipping carton.
2. Remove polyurethane cover from top of printer. This will peal off the foam cover at the same time.
3. Lift up and remove main body of outer shipping carton. This part of carton will fold flat for easy storage.
4. Remove tape and protective blocks from around Pedestal.
5. Remove all separately packaged items (such as manuals, ribbon cartridge, paper rack, vinyl dust cover) from the back of Pedestal.
6. Carefully lift Printer and Pedestal up and away from polystyrene base and bottom end cap of shipping carton.

WARNING

Complete assembly weighs approximately 135 pounds (61.2 kg).



PLH-5006

Figure 2-1. Right Side - TermiNet 340 Line Printer

7. Leveling feet on bottom of Pedestal are preset at the factory. However, if floor is uneven at Printer location, adjust leveling feet as necessary to achieve stable support. Locking nuts on leveling feet must be tightened after adjustment is complete.

INSTALLATION

With the TermiNet 340 Line Printer removed from its shipping carton, proceed as follows:

1. Place Printer-Pedestal assembly on firm, flat surface in well-lighted area.

2. Raise Printer hinged top cover. Lift at ridges on sides of top cover.

3. Make certain that drive belts are in place and routed properly (see Figure 2-1).

4. Check that motor pulley at right rear of Printer is correctly installed for input frequency to be used as shown on Figure 2-1.

5. Make certain that print belt turns freely by hand.

6. Install the Platen assembly, as follows:

   (a) Unwrap Platen assembly.

   (b) Open Platen latches (right side and left side of Printer, see Figure 2-1), install Platen and close latches.

7. Install the ink ribbon cartridge per the instructions in Chapter 3.

8. Close the Printer cover.

9. Install paper rack assembly on top of Printer by hooking the two loops on the rack over the studs located in the top cover flanges.

10. If an international power supply with multivoltage transformer (44C414423-G03) in the Pedestal is used, proceed as follows (refer to Figure 2-2):

WARNING

Be sure power line cord is not connected to a local power source before proceeding.

   (a) Remove Pedestal rear panel.

   (b) Remove Warning plate (secured by two screws) from multivoltage transformer in lower left corner of Pedestal (facing rear of Pedestal).

   (c) A small terminal board is now visible. Remove tape from diconnected brown wire and connect to voltage tap on terminal board which matches local supply line voltage (terminals 1-5).

   (d) Where local electrical codes require a neutral fuse, remove jumper from terminal positions 9 and 10. Where neutral fuse is not required, leave jumper in place as shown in Figure 2-2. Check that line fuse and neutral fuse (where required) are securely installed in fuse holders.

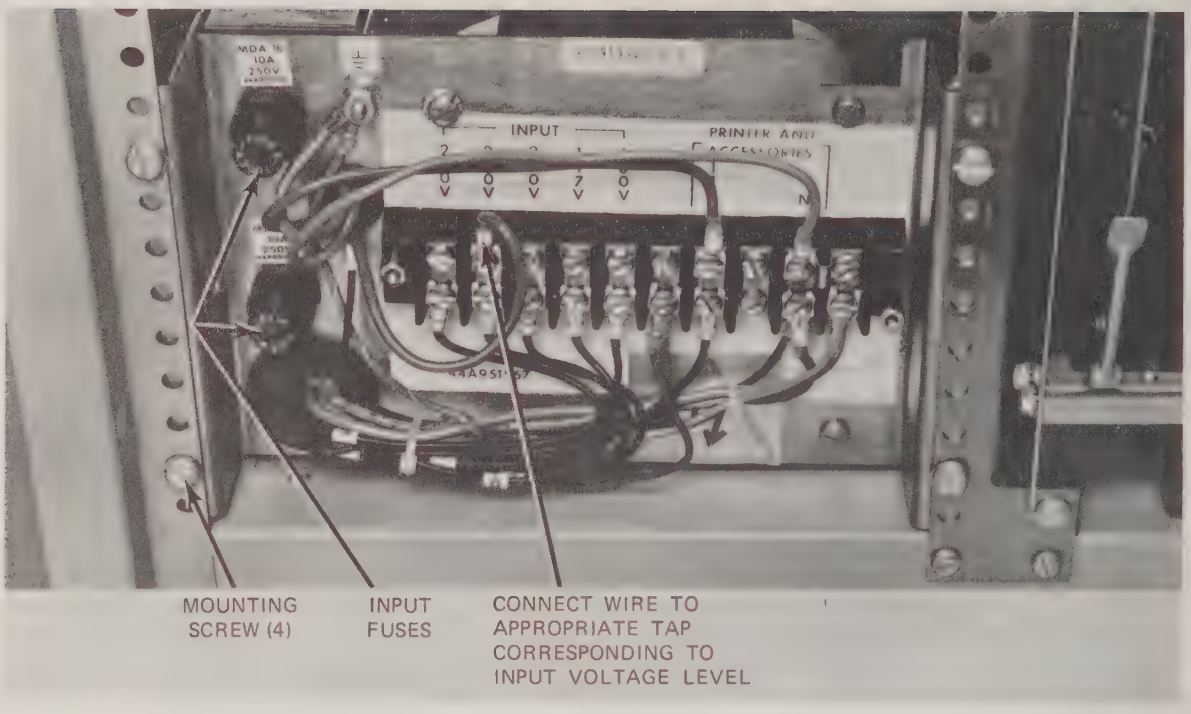
   (e) Replace Warning plate removed in step b above, and Pedestal cover removed in step a above.

11. The Printer is shipped with a rear low paper sensor installed, but disabled. To enable the rear low paper sensor, should the customer desire the feature, remove the sensor enabling plug (attached to the front bottom left of the Printer) from the Printer mounted jack. Conversely, to disable the rear low paper sensor, insert the sensor enabling plug in the jack.

12. The internal cable and jack for an optional front low paper sensor is shipped installed in the Printer. If the optional front low paper sensor kit is to be installed, proceed as follows:

   (a) Attach right and left brackets to rod using two No. 8-32 x 1/4" pan head screws. (Bracket angles are at outer sides.)

   (b) Using four No. 8-32 x 1/4" pan head screws and four No. 8 flat washers, attach



PLH-5007

Figure 2-2. Multivoltage Transformer - Front View

brackets to existing vent slots on front pedestal panel. Use outer left vent slot and fourth vent slot in from right side.

(c) Snap Switch and Guide Assembly onto rod.

(d) Remove the rear low paper sensor enabling plug, if inserted, and connect the front low paper sensor plug in its place.

NOTE

Connecting this plug automatically disables the rear low paper sensor.

13. If applicable, secure optional paper shelf in back of Pedestal by hooking it over studs protruding from sides of Pedestal.

REVERSAL OF DRIVE MOTOR PULLEY

NOTE

For 60 Hz input power, the smaller diameter side of the pulley must be positioned inboard (next to motor) to drive the belt.

For 50 Hz input power, the larger diameter side of the pulley must be positioned inboard to drive the belt.

If drive motor pulley reversal is necessary to accommodate local power supply, proceed as follows (see Figure 2-1 for component locations):

1. Open Printer cover.
2. Loosen the four motor mounting screws.
3. Loosen the two motor pulley set screws and remove pulley from motor shaft.
4. Reverse pulley and reinstall on shaft; tighten the two motor pulley set screws.
5. Slip drive belt over correct diameter motor pulley and position drive belt parallel to side of Printer frame. Adjust for correct belt tension by moving motor toward front or rear of Printer. Tighten motor in place while holding belt tension as follows:

A 4 ounce (114 gm) load deflects belt 0.10 to 0.30 inch (2.5 to 7.6 mm). Load should be applied perpendicular to belt at mid-span.

Tighten all four motor mounting screws evenly, one turn at a time. Do not tighten any one screw completly before tightening the others an equal amount.

INK RIBBON CARTRIDGE INSTALLATION

Install Ink Ribbon Cartridge (44A419819-G01) as follows (refer to Figure 2-3).

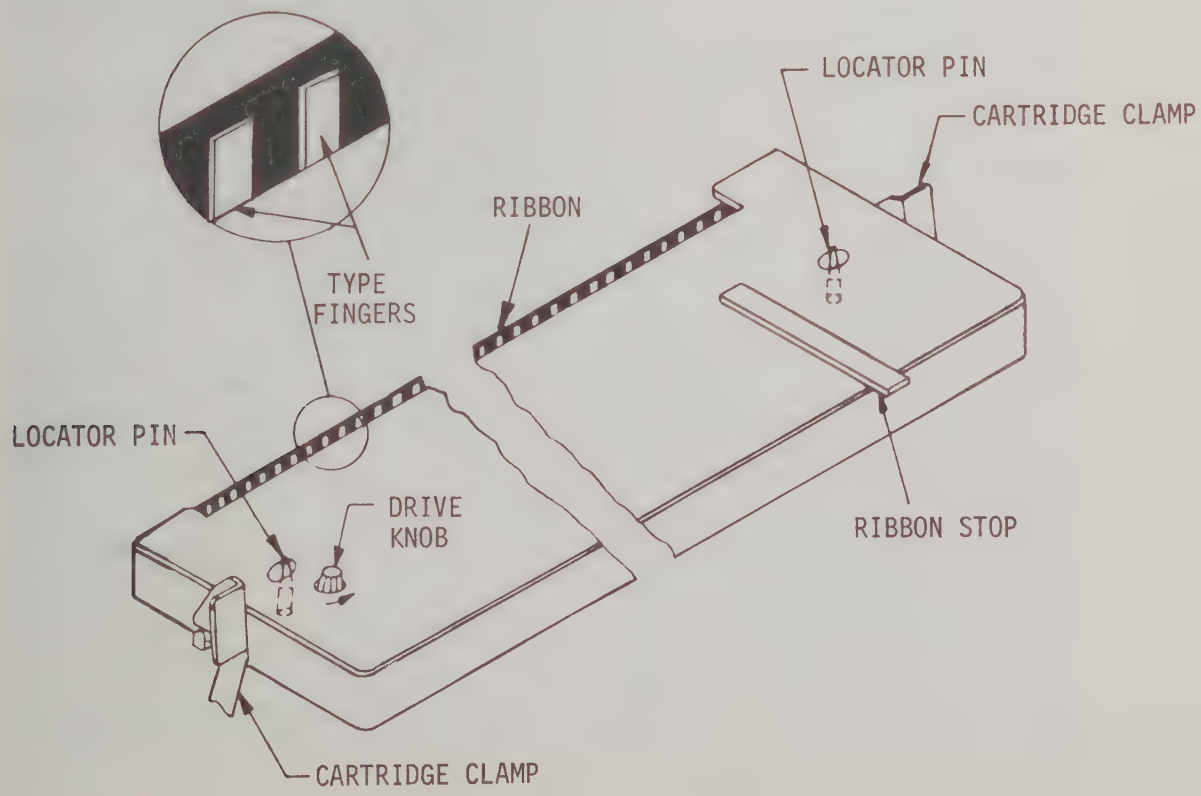
CAUTION

Printer can be damaged by incorrect installation.

1. Raise Printer top cover.
2. Place Printer Run/Load Lever in RUN position.
3. Prior to insertion of Ink Ribbon Cartridge, rotate Drive Knob in counterclockwise direction to insure that ribbon is taut.
4. Load cartridge onto the two locator pins and press down on four corners of cartridge until cartridge clamps snap into place.
5. Inspect all type fingers to insure that they are on same side of ribbon as shown.
6. If all type fingers are not on same side, release cartridge clamps, lift off cartridge and repeat steps 3 through 5.
7. Remove ribbon stop from cartridge.

NOTE

To remove a used cartridge, release cartridge clamps and lift off used cartridge as in step 6 above.



PLH-5002

Figure 2-3. Ink Ribbon Cartridge Installation

PAPER INSTALLATION

The TermiNet 340 Line Printer prints on single or multiple-part, continuous pin feed, edge punched paper. The tractor is variable to handle paper widths from 3 inches (7.6 cm) to 15.00 inches (38.1 cm). Paper loading may be accomplished from front or rear of Printer, as follows (see Figure 2-4):

PLH-6111

REAR

PLH-6112

FRONT

Figure 2-4. Printer Paper Loading.

1. Place paper supply at front or rear of Printer, as desired.

2. Push Paper Loading Lever down to LOAD position.

3. Feed Paper into front or rear of Printer. If multiple form sets are used, they should be loaded only into the front of the Printer with the shiny side of their carbon paper toward the rear of Printer.

NOTE

Be sure paper slides over Paper Out switch and not beside it, since paper cannot be moved laterally onto the switch.

4. Continue feeding paper until it appears in front of platen. Raise clear plastic paper shield and pull enough paper through to reach beyond tractors. Be sure paper alignment is straight with respect to Printer.

5. Release tractors by pushing down on small tractor lever. Slide tractors to left or right as required to align with paper width being used.

6. Instal paper on tractor pins, then close tractor covers and lock in place by pushing up on small tractor levers.

7. Push up on Paper Loading Lever to RUN position.

8. Close clear plastic paper shield.

9. Check that paper is in correct alignment with paper rack on top of Printer so that paper can slide smoothly along rack during Printer operation.

PREPARATION FOR USE

1. Check that Power switch on Pedestal is OFF, then check the following:

   a. If other than standard 117V power supply is being used, multivoltage transformer connections have been accomplished in accordance with procedures previously described.

   b. Correct diameter side of drive motor pulley is being used for the local supply frequency available.

   c. Ink Ribbon cartridge is installed.

   d. Paper is installed.

NOTE

Since TEST pushbutton operates all 132 columns, be sure that 132 column width paper is used for checkout.

2. Connect or simulate data source, as required.

NOTE

Checkout prodecures are provided for applicable interface configurations in the OPERATIONAL CHECKOUT PROCEDURE.

3. 117V AC Local Power Supply: Connect male end of three-conductor power cord to properly grounded 117V AC power source.

   Other than 117V AC Local Power Supply:

   a. Assure that steps 1a and 1b on page 2-6 have been accomplished.

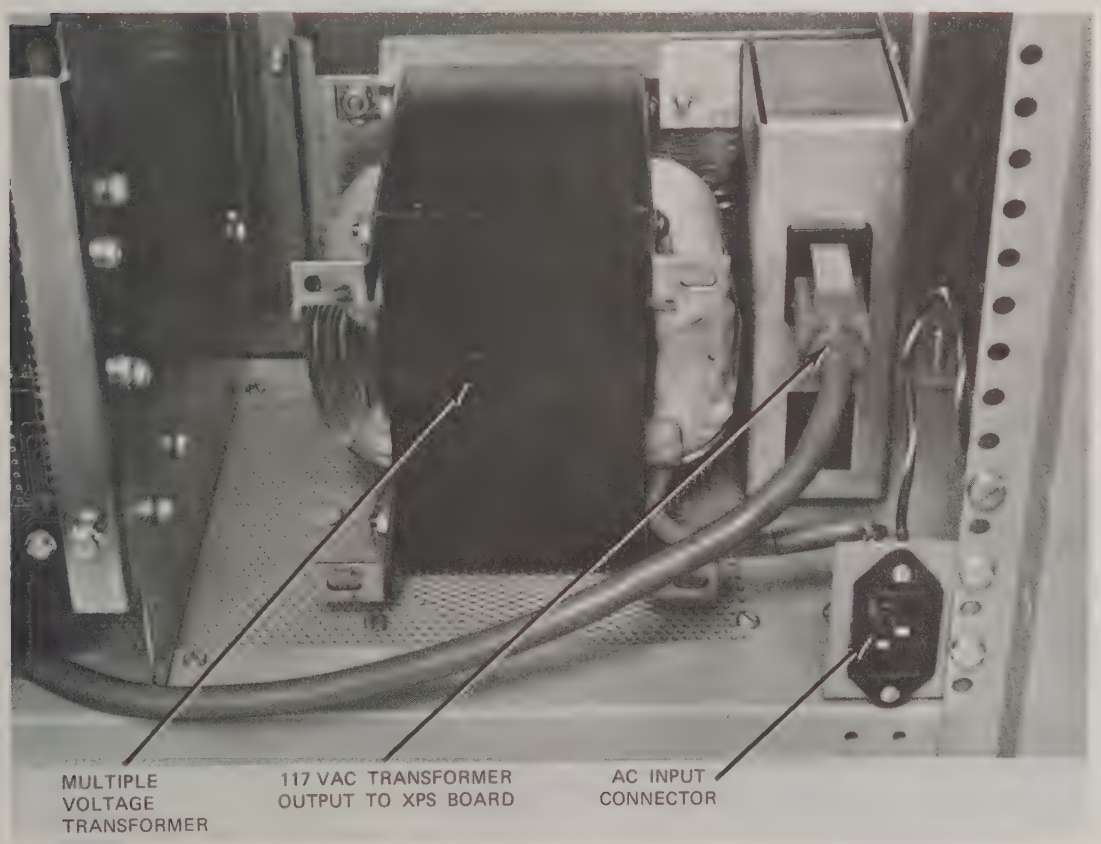
   b. Then remove rear panel from Pedestal and connect male end of Printer power cord to multivoltage transformer plug as shown in Figure 2-5.

   c. Replace rear panel of Pedestal.

   d. Connect female end of three-conductor power cord at lower right corner of Pedestal (facing rear of Pedestal).

   e. Attach the three spade connectors at other end of power cord to locally required connector (color code: Brown = Phase, Blue = Neutral, Green with yellow stripe = earth).

   f. Connect to properly grounded local power source.



PLH-5014

Figure 2-5. Multivoltage Transformer - Rear View

SECTION 2

CHECKOUT

This section contains checkout prodecures for the TermiNet 340 Line Printer. It also contains information for checking the various Interface Circuits which may be used in different Printer configurations. In following this procedure, skip any steps which are not applicable to the particular Printer being checked out. The chart shown below lists the various Interface Circuits which may be installed in the Printer.

Table 2-1.

Line Printer Interfaces

INTERFACE NO.	DESCRIPTION
1	Standard Parallel Interface
2	Buffered Parallel Interface
3	Unbuffered Parallel Interface
4	Buffered Closed Loop Serial Interface
5	Unbuffered Closed Loop Serial Interface

CHECKOUT PROCEDURE

1. After completing procedures under PREPARATION FOR USE, press Power switch on front of Pedestal to ON position. Three fans begin operating (front of Printer, rear of Printer, bottom of Pedestal).

NOTE

Printer will not operate unless top cover is down, Paper Out switch is activated, and print belt is up to speed (or a VT or FF is commanded with no Paper Tape in the VFU).

2. Press MOTOR ON pushbutton. Motor starts and, on Interface 1 only, MOTOR ON indicator lights.

3. Press TEST pushbutton for approximately 5 seconds. Alphabet, numerals, and symbols test series is printed out in sequential counting order of the ASCII code as long as TEST pushbutton is pressed down. Line feed operates automatically.

4. Press MOTOR OFF pushbutton. Motor stops and, on Interface 1 only, MOTOR ON indicator goes out. Fans continue to operate.

5. Interfaces 1, 3, and 5 only: Press MOTOR ON pushbutton, as in step 2 above. All Interfaces: Press LINE FEED. On Interfaces 2 and 4, motor starts. On all interfaces, paper advances one line each time the pushbutton is pressed.

6. Tear off paper entering Printer at paper perforation nearest point of entry. Use LINE FEED pushbutton to advance paper until low paper condition is sensed. The result of this action varies with the interface arrangement, as follows:

   a. Interface 1: The LPFP signal is switched high at the interface to the Data Source. No direct action is taken by the Printer and printing may continue until the paper-out sensor is activated.

   b. Interfaces 2 and 4: Paper out alarm is activated, lighting the ALARM indicator.

   c. Interfaces 3 and 5: PAPER OUT indicator is lit and BUSY signal indicates data cannot be received. Now Press FORMS OVERRIDE pushbutton. Paper advances until paper out sensor (below print hammers) is activated (or until in-process form is completed as sensed from a VFU Paper Tape).

7. Reinstall paper in Printer. ALARM indicator or PAPER OUT indicator goes out, as applicable. Press MOTOR ON pushbutton. Where applicable, motor starts. Then press LINE FEED pushbutton several times. Paper advances one line at a time, as at the end of step 5 above.

8. Interfaces 2 and 4 only: Press ON LINE pushbutton. ON LINE indicator lights and Printer goes into an On-Line condition, ready to accept data from data source.

9. Interfaces 2 and 4 only: Press LOCAL pushbutton. ON LINE indicator goes out and Printer goes into a local condition, unable to accept data from data source.

10. Interfaces 3 and 5 only: Press SELECT pushbutton several times. This alternately sets and resets a flip-flop controlling the SLCT signal. When in the set condition (signal at high level, Printer in selected or ready condition), SELECT indicator is lit. When in the reset condition (signal at low level, Printer unable to receive data), SELECT indicator goes out.

VFU TEST

11. Install supply of user's forms in Printer.

12. Lift Printer top cover. Then lift VFU Paper Tape cover on left side of Printer and install a prepared tape in the VFU mechanism. Close VFU Paper Tape cover and Printer top cover.

NOTE

For VFU tape preparation instructions and VFU operating instructions, see TermiNet 340 Line Printer Operator's Manual, GEK-49264, or Chapter 3 of this manual.

13. For interfaces 1, 3, and 5 Only: Press MOTOR ON pushbutton. Motor starts and, on Interface 1 only, MOTOR ON indicator lights.

14. Press FORM FEED pushbutton (Interfaces 1, 2, and 4) or TOP OF FORM pushbutton (Interfaces 3 and 5). This advances paper to next hole punched in Channel 1 of the VFU paper tape loop (i.e., top of next user's form).

NOTE

Steps 15-20 require that Customer's data source be connected to Printer.

15. Using appropriately punched VFU paper tape (installed in step 12) and input data from user's data source, print out information on forms. Data should print out correctly. (If form aligns incorrectly with data, inspect punched paper tape for error.)

16. For Interface 3 and 5 only: Tear off form entering Printer at form perforation nearest point of entry. Press TOP OF FORM pushbutton. Form advances only until it reaches appropriate (i.e., front or rear) low paper sensor. Press FORMS OVERRIDE pushbutton. In-process form will complete its printout, then Printer will stop.

17. Repeat Step 7.

ADDITIONAL OPERATIONAL CHECKOUT INFORMATION

18. Interfaces 1, 2, and 4 Only: READY indicator is lit by data source as required to signal the operator. For Interface 1, the READY indicator is lit when the RTP signal is held at a high level; for Interfaces 2 and 4, the READY indicator is lit when the RTP signal is held at a low level.

19. Interface 1 only: INTERRUPT pushbutton, when pressed, provides a high level signal at the interface to the data source, as required. The Printer logic does not respond to this pushbutton.

20. Interface 1 Only: HERE IS pushbutton, when pressed, provides a high level signal at the interface to the data source, as required. The Printer logic does not respond to this pushbutton.

21. All Interfaces: Turn power switch on front of Pedestal to OFF position. Motor and all three fans cease operation. Printer is inoperative.

WARNING

Always disconnect main power cord from local supply before removing Pedestal panels.

OPERATOR INSTRUCTION

Instruct Operator in the following:

1. Use of Control Panel pushbuttons.
2. Changing of paper and ribbon cartridge.
3. Use of VFU for printing forms.

CHAPTER 3

OPERATION

INTRODUCTION

Detailed operation procedures which depict all user phases of the Printer operation are included in publication GEK-49264, TermiNet 310/320/330/340 Line Printer Operator's Manual. These user instructions will not be duplicated in this service manual. However, certain control and control function information is included to help familiarize the service technician with the operation and function of the front panel switches.

CAUTION

Do not operate Printer without ink ribbon cartridge installed, as excessive print finger wear may result.

Failure to observe this caution will void Printer warranty.

SWITCHES AND INDICATORS

Operating power is supplied to the Printer through a Pedestal-mounted switch. The location of this switch is shown in Figure 3-1.

PLH-5018

Figure 3-1. Power On Switch.

Depending upon which interface circuit board is being employed in the Printer, the function of the control panel switches and indicators differ. The following Figures 3-3, 3-4, and 3-5 illustrate the various control panels and their functions.

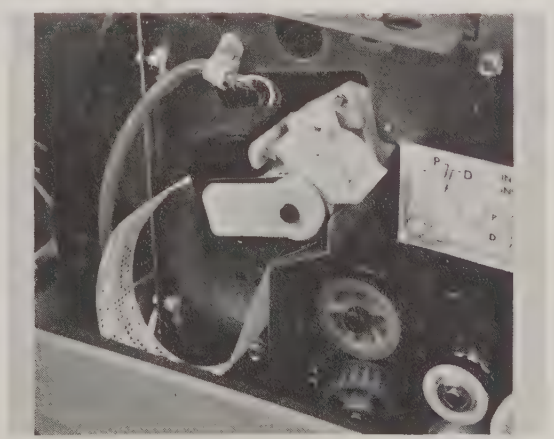
The Printer is equipped with an audible alarm (a Pedestal-mounted bell) which will be sounded whenever the BEL lead is activated by the data source. The bell may be used for whatever purpose is dictated by the system.

VERTICAL FORMAT UNIT OPTION

DESCRIPTION

The paper tape VFU (Figure 3-2) is used to feed Printer paper rapidly to a predetermined line position upon recognition of a remotely generated form feed (FF) or vertical tabulation (VT) code. The paper tape VFU uses a standard one-inch-wide eight-channel paper tape with 1/10-inch pitch sprocket holes located between channels 3 and 4 (see Figure 3-6). The sprocket holes serves as the strobe control for operating the VFU assembly and has a tape-in/tape-out function designed so the Printer will not respond to the VT/FF codes when the paper tape is missing. Channel 1 is used for form feed and channel 6 is used for vertical tab. No other channels are recognized by the tape reader.

Whenever a Form Feed command is recognized by the VFU, the programmed paper tape will rapidly advance, causing the paper in the Printer to feed out at the same rate until the VFU tape reader "sees" a hole in channel 1 of the tape. At this point the paper will stop feeding along with the paper tape. Any Vertical Tabs set (holes in channel 6) will be skipped over, as the VFU reader is looking only at channel 1.



PLH-5017

Figure 3-2. VFU Option

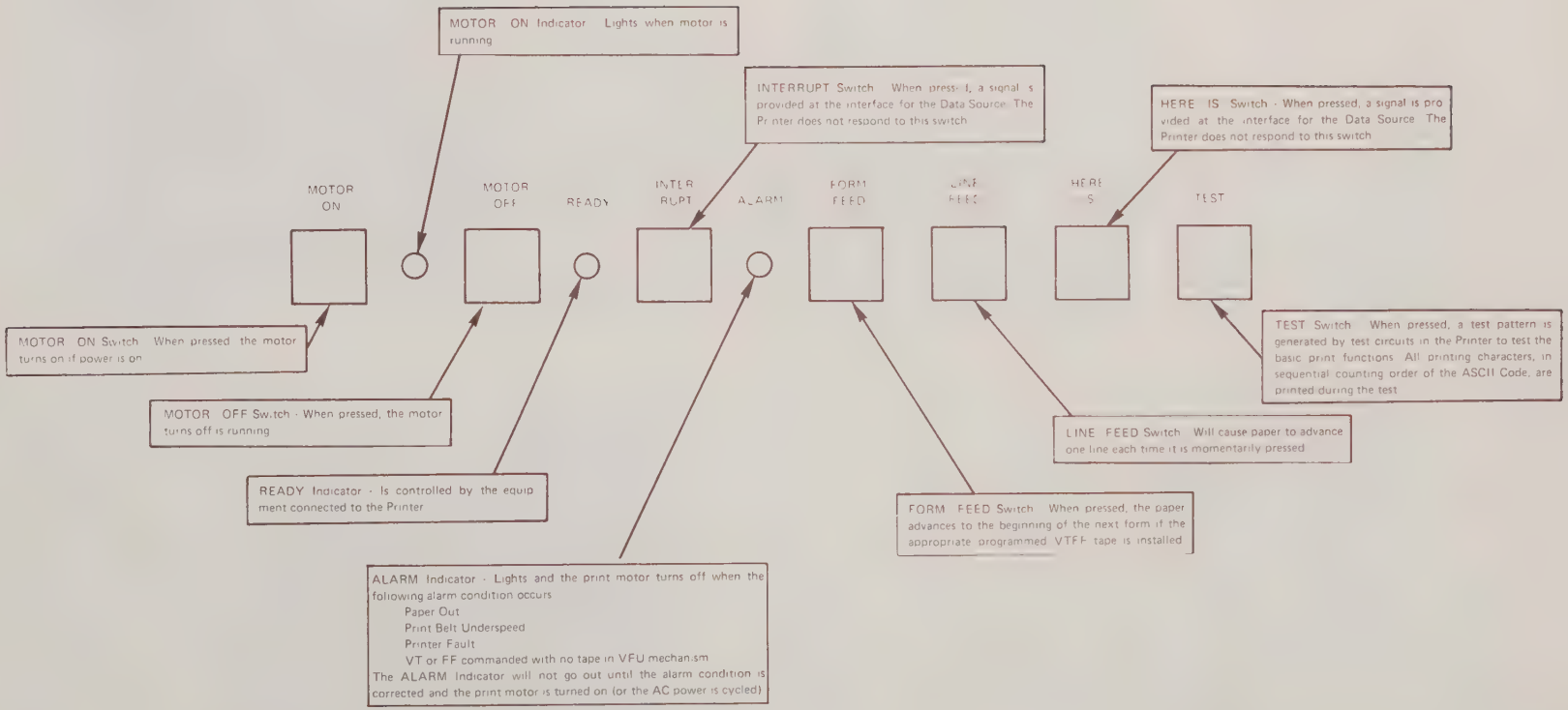

MOTOR ON Indicator · Lights when motor is running
INTERRUPT Switch · When pressed, a signal is provided at the interface for the Data Source. The Printer does not respond to this switch
HERE IS Switch · When pressed, a signal is provided at the interface for the Data Source. The Printer does not respond to this switch
MOTOR ON
MOTOR OFF
READY
INTER RUPT
ALARM
FORM FEED
LINE FEED
HERE IS
TEST
MOTOR ON Switch · When pressed the motor turns on if power is on
MOTOR OFF Switch · When pressed, the motor turns off is running
READY Indicator · Is controlled by the equipment connected to the Printer
TEST Switch · When pressed, a test pattern is generated by test circuits in the Printer to test the basic print functions. All printing characters, in sequential counting order of the ASCII Code, are printed during the test
LINE FEED Switch · Will cause paper to advance one line each time it is momentarily pressed
FORM FEED Switch · When pressed, the paper advances to the beginning of the next form if the appropriate programmed VTFF tape is installed
ALARM Indicator · Lights and the print motor turns off when the following alarm condition occurs
Paper Out
Print Belt Underspeed
Printer Fault
VT or FF commanded with no tape in VFU mechanism
The ALARM Indicator will not go out until the alarm condition is corrected and the print motor is turned on (or the AC power is cycled)
PLH-5019

Figure 3-3. Standard TermiNet Line Printer Control Panel Functions

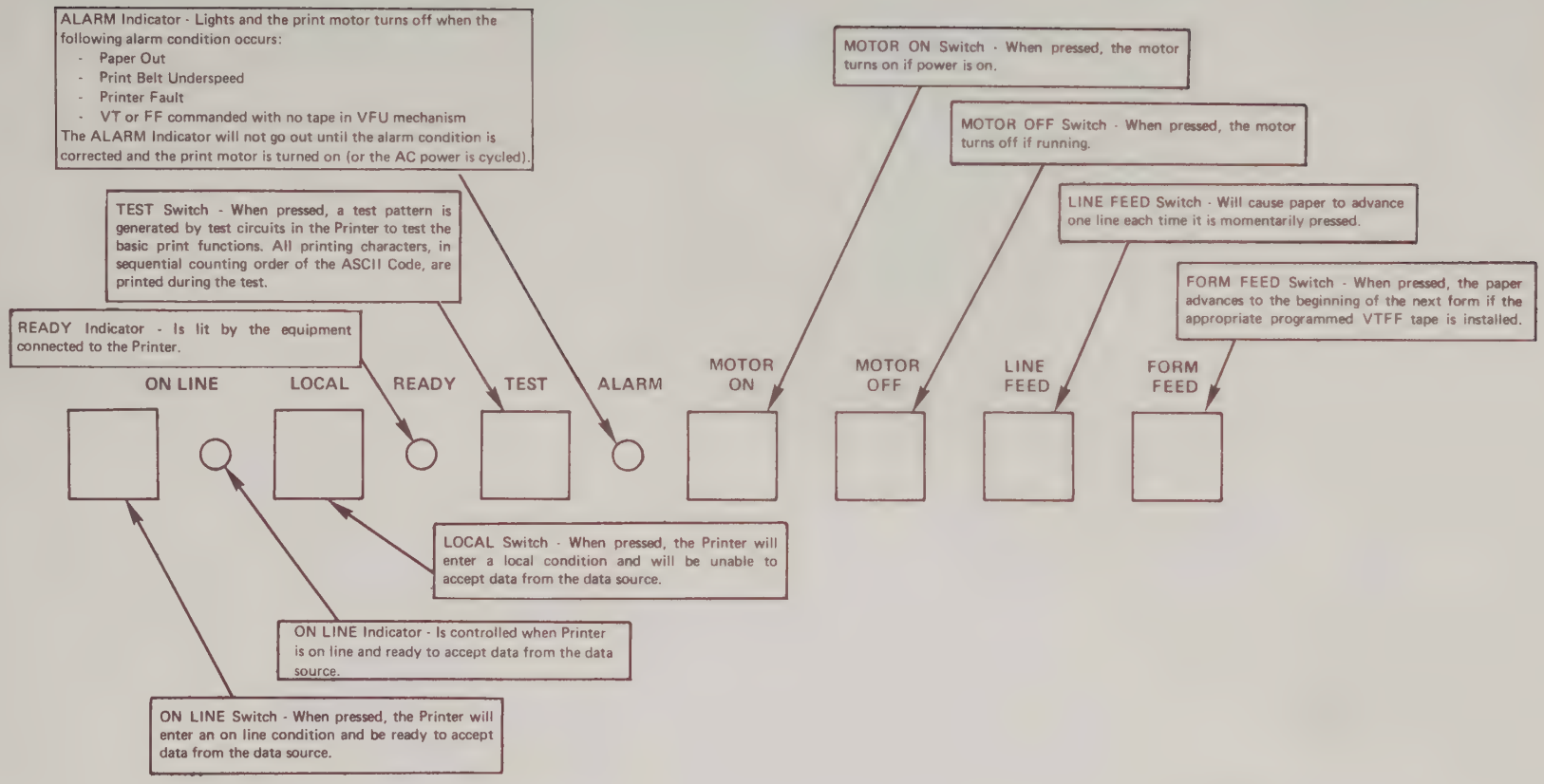

ALARM Indicator - Lights and the print motor turns off when the following alarm condition occurs:
- Paper Out
- Print Belt Underspeed
- Printer Fault
- VT or FF commanded with no tape in VFU mechanism
The ALARM Indicator will not go out until the alarm condition is corrected and the print motor is turned on (or the AC power is cycled).
MOTOR ON Switch - When pressed, the motor turns on if power is on.
MOTOR OFF Switch - When pressed, the motor turns off if running.
LINE FEED Switch - Will cause paper to advance one line each time it is momentarily pressed.
FORM FEED Switch - When pressed, the paper advances to the beginning of the next form if the appropriate programmed VTFF tape is installed.
TEST Switch - When pressed, a test pattern is generated by test circuits in the Printer to test the basic print functions. All printing characters, in sequential counting order of the ASCII Code, are printed during the test.
READY Indicator - Is lit by the equipment connected to the Printer.
ON LINE
LOCAL
READY
TEST
ALARM
MOTOR ON
MOTOR OFF
LINE FEED
FORM FEED
LOCAL Switch - When pressed, the Printer will enter a local condition and will be unable to accept data from the data source.
ON LINE Indicator - Is controlled when Printer is on line and ready to accept data from the data source.
ON LINE Switch - When pressed, the Printer will enter an on line condition and be ready to accept data from the data source.
PLL-5099

Figure 3-4. Buffered Parallel Interface TermiNet Line Printer Control Panel Functions.

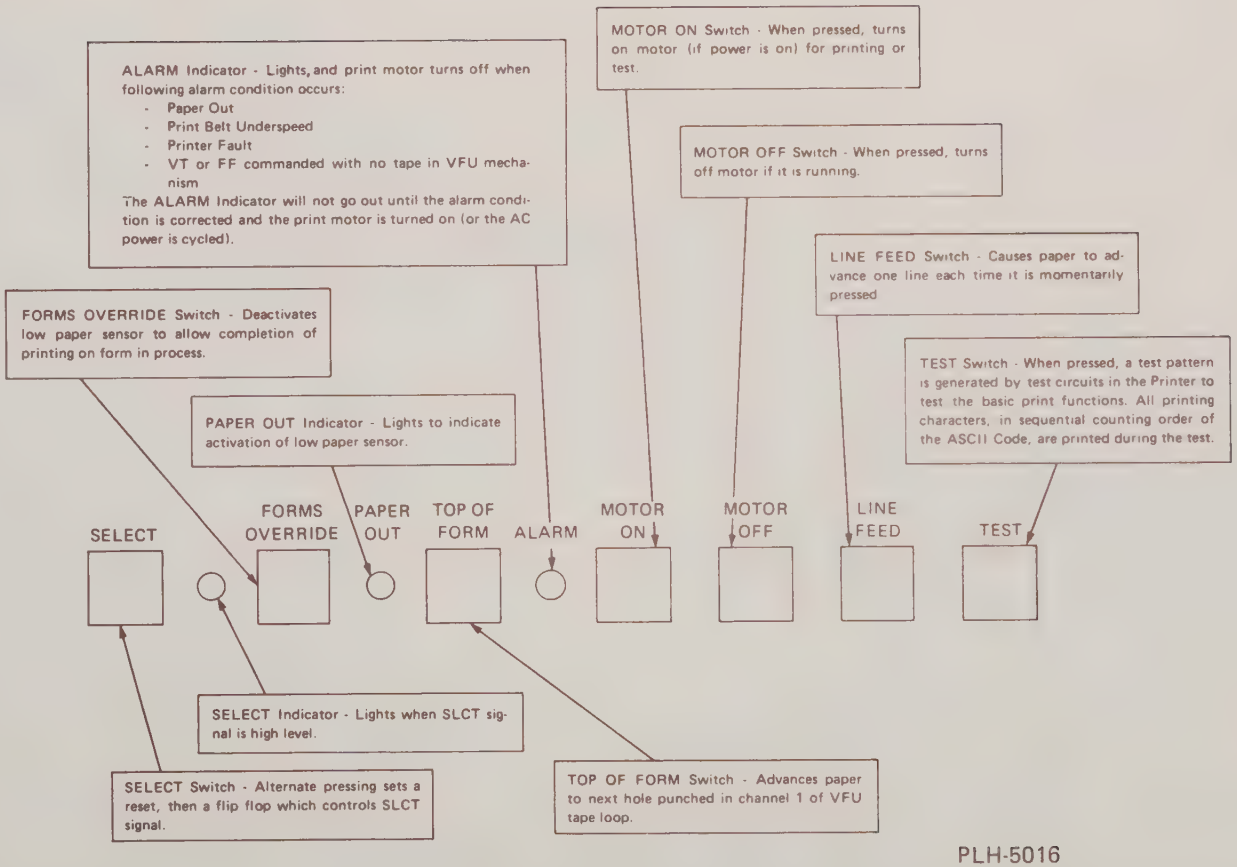

ALARM Indicator - Lights, and print motor turns off when following alarm condition occurs:
- Paper Out
- Print Belt Underspeed
- Printer Fault
- VT or FF commanded with no tape in VFU mechanism
The ALARM Indicator will not go out until the alarm condition is corrected and the print motor is turned on (or the AC power is cycled).
MOTOR ON Switch - When pressed, turns on motor (if power is on) for printing or test.
MOTOR OFF Switch - When pressed, turns off motor if it is running.
LINE FEED Switch - Causes paper to advance one line each time it is momentarily pressed
FORMS OVERRIDE Switch - Deactivates low paper sensor to allow completion of printing on form in process.
TEST Switch - When pressed, a test pattern is generated by test circuits in the Printer to test the basic print functions. All printing characters, in sequential counting order of the ASCII Code, are printed during the test.
PAPER OUT Indicator - Lights to indicate activation of low paper sensor.
SELECT
FORMS OVERRIDE
PAPER OUT
TOP OF FORM
ALARM
MOTOR ON
MOTOR OFF
LINE FEED
TEST
SELECT Indicator - Lights when SLCT signal is high level.
SELECT Switch - Alternate pressing sets a reset, then a flip flop which controls SLCT signal.
TOP OF FORM Switch - Advances paper to next hole punched in channel 1 of VFU tape loop.
PLH-5016

Figure 3-5. Unbuffered Parallel Interface TermiNet Line Printer Control Panel Functions.

A recognized Vertical Tab command will cause the VFU to operate in the same manner as described above except that the VFU tape reader will "look for" channel 6 holes only while the tape is advancing through the reader. The first hole "read" in channel 6 by the VFU tape reader will cause the tape to stop moving and the paper in the Printer will stop feeding at the same time.

NOTE

If a VT code is initiated and there is no corresponding hole in the tape, the Printer will continue to advance paper to the start of the next form.

PREPARING THE VFU PAPER TAPE

A standard one inch (2.54 cm) tape 6 to 12 inches (15.2 to 30.4 cm) long is programmed by punching a hole in channel 1 to correspond with the first line on the form to be used. Holes are punched in channel 6 to correspond with selected lines on the form where vertical tabs are desired.

CALCULATING THE NUMBER OF LINE SPACES PER FORM

To determine the number of line spaces in the form to be used, simply measure the length of the form in inches and multiply by 6. If the form is measured in centimeters, multiply by 2.36 and round off to the nearest whole number.

CALCULATING THE VFU PAPER TAPE LENGTH

Once the form size and corresponding number of line spaces are determined from the above step, the length of tape (in inches) needed for the VFU format can be determined simply by multiplying the number of lines in the form by 1/10. To find the length of tape needed for the VFU format in centimeters, multiply the number of lines in the form by 0.254.

Since the tape length to be used in the VFU mechanism cannot be less than 6 inches (15.24 cm), the VFU format corresponding to forms less than 10 inches (25.4 cm) in length will have to be repeated on the prepared tape as many times as necessary to make the total tape length at least 6 inches (15.24 cm). No tape should exceed 12 inches (30.48 cm) in length.

Example No. 1

Calculate the length of tape needed for use with 11 inch forms.

STEP 1 - 11 inches x 6 = 66 lines/form

STEP 2 - 66 lines/form x 1/10 = 6.6 inches

It is determined from the above calculation that 6.6 inches of tape are required for the VFU format. Since this is over the 6 inch minimum tape length requirement, the format would appear only once on the prepared tape.

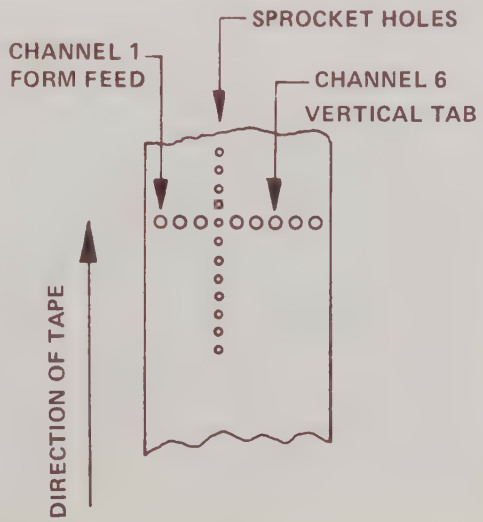
Example No. 2

Calculate the length of tape needed for use with 4 1/2 inch forms.

STEP 1 - 4 1/2 inches x 6 = 27 lines/form

STEP 2 - 27 lines/form x 1/10 = 2.7 inches

Since the length of tape needed for the format is only 2.7 inches, the format will have to be repeated as many times as necessary to meet the 6 inch minimum total tape length requirement. If the format was repeated once, the total length would be 5.4 inches which is still short of the 6 inch requirement. If the format was repeated twice, the total tape length would be 8.1 inches which satisfies the 6 inch minimum requirement. It is obvious then that the prepared tape for use with 4 1/2 inch forms would have to contain the VFU format 3 times and would be 8.1 inches in total length.



OVT-4004

Figure 3-6 Paper Tape For Use With VFU

PROGRAMMING THE VFU TAPE

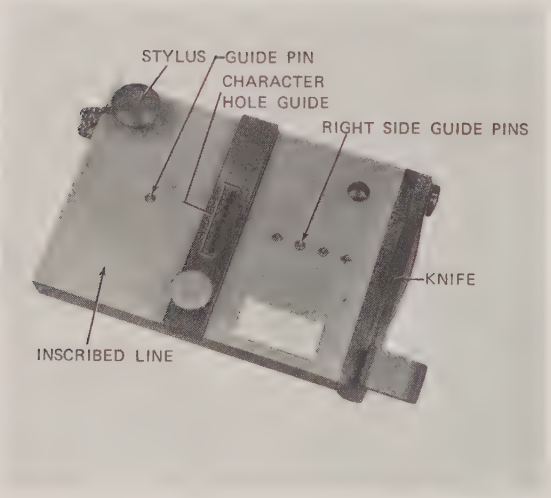
When the VFU tape length has been determined, the tape can then be punched using a manual punch or any other device capable of generating standard eight channel paper tape. When using the latter method, remember that the VFU tape reader "looks" only at channels 1 and 6. Therefore, any ASCII code character containing a "1" bit in channel 1 can be used to program a Form Feed hole in the tape. Likewise, any ASCII code character with a "1" bit in channel 6 can be used to program a Vertical Tab hole in the tape.

NOTE

A programmed Form Feed will not be affected if channel 6 is also punched along with channel 1. However, channel 1 cannot be punched along with channel 6 for programmed Vertical Tabs.

Manual Punch and Splicer

A Manual Punch and Splicer tool (part number 44A418630-003) is available which facilitates the making of VFU tapes. Figure 3-7 illustrates this tool.



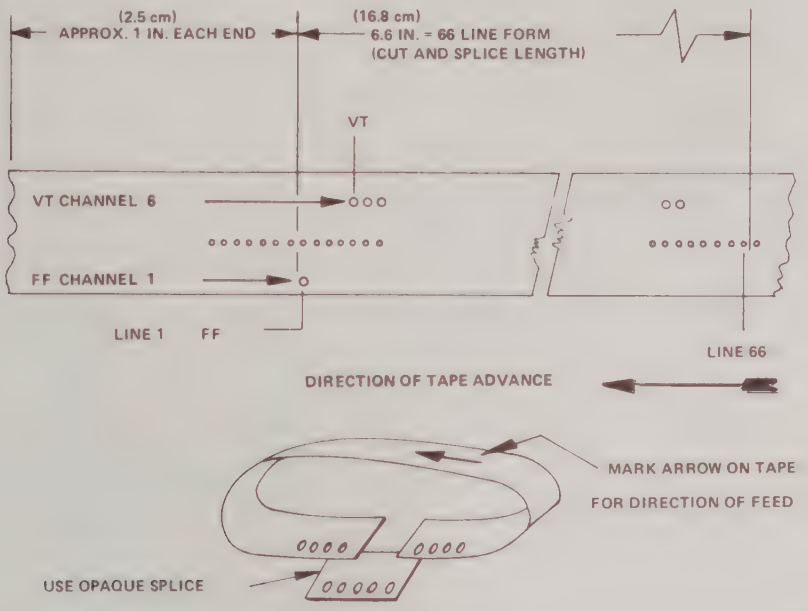
OVT-5003

Figure 3-7. Manual Punch and Splicer.

To use the Manual Punch and Splicer tool refer to the following procedure:

1. Obtain a 14 inch (35.6 cm) length of paper or mylar tape with prepunched sprocket holes.
2. Mark the tape length for a particular form length, determined from the previously given calculations.
3. With the Manual Punch and Splicer on a flat surface, place the length of paper tape parallel to the left side of the die. Place the tape feed hole on the guide pin so that the character column to be punched is directly over the inscribed line.
4. Place the tape under the die and secure it with the right side guide pins.
5. Insert the stylus into the desired character hole and punch it through the tape. Remove the stylus and advance the tape to align the next desired character column under the die. Proceed in this manner until the complete tape is prepared.
6. Verify the punched tape as to proper content and calculated line length.
7. Raise the knife and lay the prepared tape across the die. Position the sprocket holes on the guide pins so that the knife will cut the tape exactly between the desired punched characters. Lower the knife and cut the tape.
8. Butt together the two ends of the prepared tape, and align the sprocket holes on the right guide pins. The butted joint must center between the second and third guide pins.
9. Remove the protective sheet from a section of splicing tape and overlay the splicing patch on the butted joint. Be very careful to align the patch sprocket holes on the guide pins.
10. Smooth the patch and reinspect the punched tape for correct punches and junction.

Figure 3-8 illustrates a punched VFU tape prepared on a Manual Punch and Splicer for 11 inch (27.94 cm) forms having 66 lines. Vertical tabs are shown punched in lines 5, 6, 7, 60, and 61. The Figure 3-8 illustration also shows the joining technique.



OVT-4007

Figure 3-8. Example of 66-Line, 11-inch (27.9 cm) Form Preparation Using a Punch and Splicer

After the VFU paper tape has been programmed and the ends of the tape have been joined together with an opaque splice so as to form a loop, the tape should be marked with an arrow to indicate the direction of feed.

OPERATING THE VFU

1. Lift the Printer top cover to permit access to the VFU mechanism.
2. Lift the tape hold-down cover and install the programmed tape over the sprocket ensuring that the sprocket teeth engage the paper tape sprocket holes.
3. Close the tape hold-down cover.
4. Close the Printer top cover.
5. Turn the Printer on and press the Form Feed (FF) key (pushbutton on SR units). This will advance the paper tape to the next Form Feed position.
6. Adjust the form on the Printer according to the user's requirement.

OPERATIONAL PROBLEMS

Should the VFU fail to operate properly, consult Chapter 5, "Parts Replacement and Adjustments" for adjustment procedures.

OPTIONAL PAPER FEEDING COMMANDS

The optional paper control character in each line of data transferred from the data source to the Printer is reserved for paper action. The location of this character in the data line depends on the type of interface used. The Printer internal logic will respond as follows to this character:

DATA BITS								
7	6	5	4	3	2	1	ACTION	EQUIVALENT ASCII CHARACTER
1	SLEW DATA						VERTICAL SLEW	(SEE TABLE 3-1)
0	1	0	0	0	0	0	VERTICAL TAB	SP
0	0	1	0	0	0	0	FORM FEED	DLE
0	0	0	1	0	0	0	LINE FEED	BS
0	1	0	1	0	0	0	VT & LF	0 (ZERO)
0	0	1	1	0	0	0	FF & LF	CAN

VERTICAL SLEW

Whenever bit 7 in the paper feeding command is a "1", paper will be slewed by the number of lines dictated by the lower 6 bits of the character. Table 3-1 lists the vertical slewing increments that the Printer will provide, and the corresponding bit patterns required. The equivalent ASCII character for each bit pattern is also listed for reference.

Table 3-1

Vertical Slewing Commands

LINES OF SLEWING	BIT PATTERN REQUIRED	EQUIVALENT ASCII CHAR.	LINES OF SLEWING	BIT PATTERN REQUIRED	EQUIVALENT ASCII CHAR.
1	1000001	A	33	1100001	a
2	1000010	B	34	1100010	b
3	1000011	C	35	1100011	c
4	1000100	D	36	1100100	d
5	1000101	E	37	1100101	e
6	1000110	F	38	1100110	f
7	1000111	G	39	1100111	g
8	1001000	H	40	1101000	h
9	1001001	I	41	1101001	i
10	1001010	J	42	1101010	j
11	1001011	K	43	1101011	k
12	1001100	L	44	1101100	l
13	1001101	M	45	1101101	m
14	1001110	N	46	1101110	n
15	1001111	O	47	1101111	o
16	1010000	P	48	1110000	p
17	1010001	Q	49	1110001	q
18	1010010	R	50	1110010	r
19	1010011	S	51	1110011	s
20	1010100	T	52	1110100	t
21	1010101	U	53	1110101	u
22	1010110	V	54	1110110	v
23	1010111	W	55	1110111	w
24	1011000	X	56	1111000	x
25	1011001	Y	57	1111001	y
26	1011010	Z	58	1111010	z
27	1011011	[	59	1111011	{
28	1011100	/	60	1111100	¦
29	1011101	]	61	1111101	}
30	1011110	^	62	1111110	~
31	1011111	_	63	1111111	DEL
32	1100000	`			

CHAPTER 4

PRINCIPLES OF OPERATION

SECTION 1

LINE PRINTER DESCRIPTION

FUNCTIONAL DESCRIPTION (Figure 4-1)

GENERAL

The TermiNet 340 Line Printer is capable of printing 340 lines of data per minute. The Printer uses the standard 7 bit USASCII code. Each full line of incoming data from the data source is buffered and then printed during one font time (i.e., the length of time required for one complete font of print fingers to pass a given column). Data is transferred from the source to the buffer during paper movement so all available time is used for printing.

The Printer control system can be made compatible with a variety of data processors and communications buffers. The Printer interface is designed for operation in either a system in which the Printer controls timing of data transfer or the data source (processor) controls all timing. The Printer interfacing is compatible with TTL (transistor to transistor logic) employing the standard 7400 series of solid state devices. The "on" state is a logic 1 signal of greater than 3 volts positive.

NOTE

Although the following description is intended to cover only one particular type of interface, many of the operating characteristics between the different types are similar.

INTERFACE

When the Printer is in the load condition (i.e., is ready to accept data), data is transferred in parallel bit fashion, character serial, from the data source through the Printer interface (INT Board) to the print memory located on the LOG board. When a full line of characters has been transmitted, a transfer signal from the interface causes the print sequence to begin. At this time, the interface signals the data source that the Printer is busy printing. A new line of data cannot be received until the old line is completely printed. After the data line has been printed, the interface signals the data source that the Printer can again accept one line of data. The INT board then acts as a data flow regulator.

Another function of the INT board is to decode the first character (last character in certain systems) of each data line. This 7 bit non-USASCII code character is a paper feed code which initiates the LF, VT, or FF paper feed commands.

As each printable character is received at the INT board, it is checked for correct parity. If an error is detected in a character being processed, the INT board will cause a diamond to be printed in place of the character having the incorrect parity (strapping option).

Data is presented to the INT board from the data source over data lines D1 to D8. The data is strobed in by a 2 μs strobe pulse. The maximum instantaneous transfer rate is 60,000 cps. An ACK signal is sent to the data source by the INT board each time a character has been strobed into memory. This is for data sources using a closed loop by character system. Other systems may not employ the ACK signal.

The data source must be able to recognize the state of the interface signal RFP (Ready from Printer) which is used to signal the data source whether or not the Printer can accept more data. After each line of data is sent to the Printer, the data source should generate the signal TRAN (Transfer). If the data source does not have the capability to generate a TRAN signal, but just scans RFP as a go-no go status, then the Printer can internally generate a substitute for TRAN. Signal RFP is also used to alert the data source as to several status conditions in the Printer such as Alarm, Low Voltage, and Test.

Other interface signals used on the INT board are Answerback, Bell, Frame Ground, Interrupt, Low Paper, Motor Off, Motor On, Motor-Or-Feeding, Power On, and Signal Ground.

MOTOR CONTROL

When power is first applied, all circuits of the Printer are initialized. At that time, the motor is off, the

print memory is cleared, and the Printer is in the load condition. When the MOTOR ON signal is received from the pushbutton on the control panel, or remotely from the data source, the motor timer signal MTD energizes the motor relay on the XPS board. MTD will remain on long enough to allow the print belt to attain full speed. The MOTOR ON signal also clears any prior alarm condition. Whenever an alarm condition exists in the Printer due to a Fault, Paper Out, or Low Speed detection, the appropriate circuits on the LOG board will turn off the motor.

DATA TRANSFER*

When the Printer is in the load condition, data is transferred bit parallel, character serial from the data source, through the interface, and into print memory on the LOG board. Character Data is received asynchronously at the Data Latches which are set by the Data Strobe. A synchronized Data Strobe then transfers each character from the latches to the print memory shifting the print memory and advancing the column counter. When the full line of characters has been transmitted, a transfer signal from the interface clears the load mode and the print sequence begins. A print complete signal sets the Load circuit to return the Printer to the load condition when the data has been printed.

PRINTING

Printing is accomplished by energizing the desired print hammer solenoids at the appropriate belt position so that they strike the desired moving type finger. Basic timing for the print dynamics is provided by drive counters on the LOG board. The counters are initialized to the drive state by each finger timing signal from the PSR board and then advanced through succeeding states by the system clock. A Drive Signal turns on a High Voltage Switch (HVS board) which applies power to its respective Hammer Bank to energize those columns which have been pulled by Column SCR's on the LHD board. At the end of the drive period, a commutate signal from the LOG board causes the High Voltage Switch (HVS board) to supply a negative voltage to its hammer bank for commutation of the column SCR's on LHD. Finally, the drive counter on LOG advances to the compare state removing the commutate signal to allow the HVS to again go positive so that column SCR's may be fired in preparation for the next drive period. Since belt timing alternates between even and odd finger signals, all drive timing is symmetrically interlaced.

When the print condition exists, Print Memory is shifted and circulated at system clock rate and the Column Counter is advanced to keep in step. Belt position is derived from the belt timing signals and it is compared with the character code and the associated column number to produce the column SCR firing pulses. Each time a fire pulse is emitted, an erase signal is applied to the data multiplexer to remove the character from memory by preventing recirculation. The LOG board also contains circuits that prevent firing hammers when the motor is stopped, when paper is in motion, when the maximum fire counter is limiting, or when there is no compare signal from either of the drive counters. During the inhibit fire condition, printing is suspended but no data is removed from memory. The belt printing logic contains circuits to detect an empty memory and generate a print complete signal.

PROTECTION

To protect the Printer against energizing too many hammer solenoids at one belt position, a Maximum Fire Counter receives all SCR fire pulses. If it counts an excessive number of pulses, it produces a fire limit signal to suspend firing for the remainder of that finger period. This counter is restored by the belt timing signals at the beginning of each finger period. Suspension of firing causes no data loss but it delays the printing of the suspended characters for one full font period.

To prevent printing characters at an average rate that cannot be sustained by the Printer, a Rate Control Counter on the LOG board produces a Rate Limit signal to delay the Print Complete indication and suspend transfer of more data.

PAPER ACTION CONTROL

Platen motion is controlled by the line feed clutch which is operated by the line feed solenoid. The line feed solenoid is energized by the LOG board in the execution of any of the four paper actions; line feed, form feed, vertical tab, and vertical slew. All actions may be initiated by the remote data source. Line Feed and Form Feed pushbuttons are on the front panel for manual control.

Paper action is also controlled by a vertical tab and form feed mechanism which uses a punched paper tape loop. Photoelectric sensing of its sprocket holes and vertical tab and form feed stop holes provides signals to the system control logic on the LOG board.

*May vary with type of Interface used.

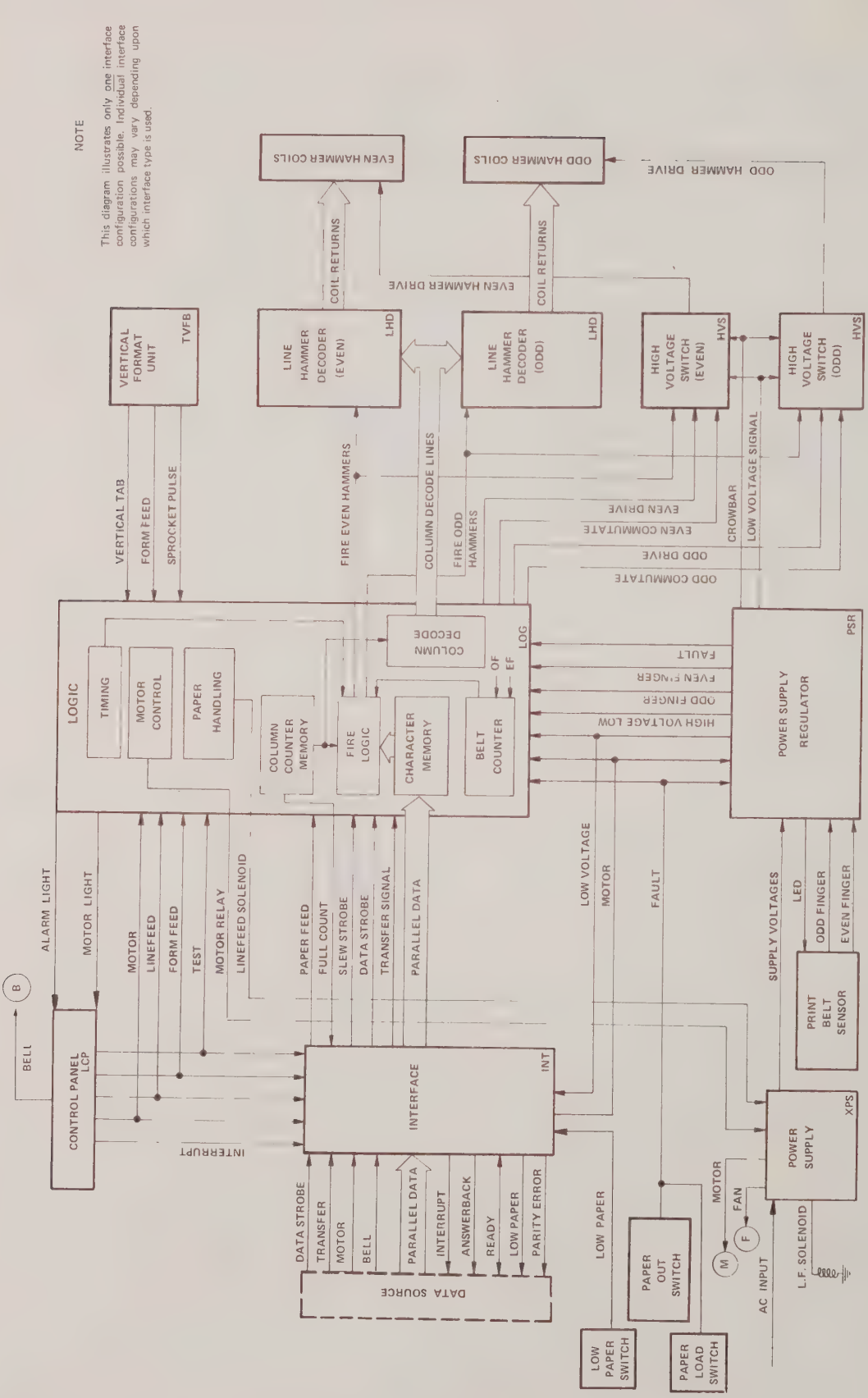
A line feed signal triggers the Line Feed Timer which provides a line feed solenoid pulse. A form feed signal sets the Form Feed Flip-Flop which holds until the form stop signal from the form feed photoelectric circuit clears it. A vertical tab signal sets the Vertical Tab Flip-Flop which holds until either the vertical tab stop or the form feed stop clears it.

Vertical slew is started by setting the Slew Counter to the contents of the Data Latches when a slew strobe is received from the interface. This counter provides paper slewing until it has been counted back to zero by sprocket pulses from the form feed photocircuit.

A Line Feed Solenoid Timer is used to control the line feed solenoid driver. If a paper action is too long, the LFS timer will time out and cause an alarm condition. The trailing edge of LFS triggers the Line Feed Delay Timer which provides the necessary delay for the platen to come to rest after the line feed solenoid is dropped. A feeding signal is provided to suspend printing during paper action.

SELF TEST FEATURE

The LOG board also provides circuits for the self test feature on the Printer. From the TEST pushbutton on the front panel, a test signal is applied to the Test Generator which produces characters in ascending order of the ASCII code during a test load sequence. When a line of data has been generated, a stop test generation signal from the Column Counter halts the generator counter at the proper position and stops the load sequence. When printing of the line is complete, the print complete signal triggers the line feed timer. Also the test generator resumes its generation of data starting one character code lower than it did for the previous line. Thus, a staggered test pattern is printed.



PLH-6114

Figure 4-1. TermiNet 340 Line Printer Functional Block Diagram

SECTION 2

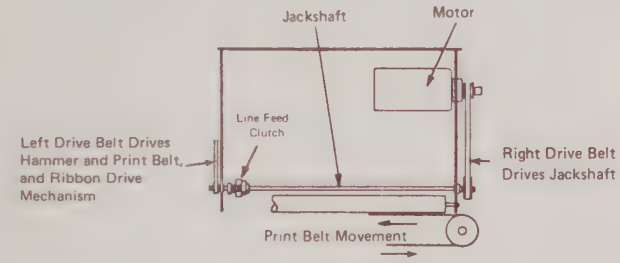
MECHANICAL OPERATION

MAIN DRIVE

The drive power (see Figure 4-2) for the Printer is Provided by a motor located under the XPS board at the right side of the Printer. The power from the motor is transmitted by means of the right drive belt to the right drive pulley on the jackshaft. The jackshaft transmits the power to two separate areas, the first being the line feed clutch used for advancing the paper. The second output from the jackshaft goes to the left drive pulley which transmits power to the left print belt pulley shaft by means of the left drive belt. The left print belt pulley shaft drives the print belt, and also drives the ribbon drive through a gearing arrangement on the bottom of the left pulley support casting. Any time the motor is running, the print belt will rotate counter-clockwise, and the ribbon will move continuously from right to left.

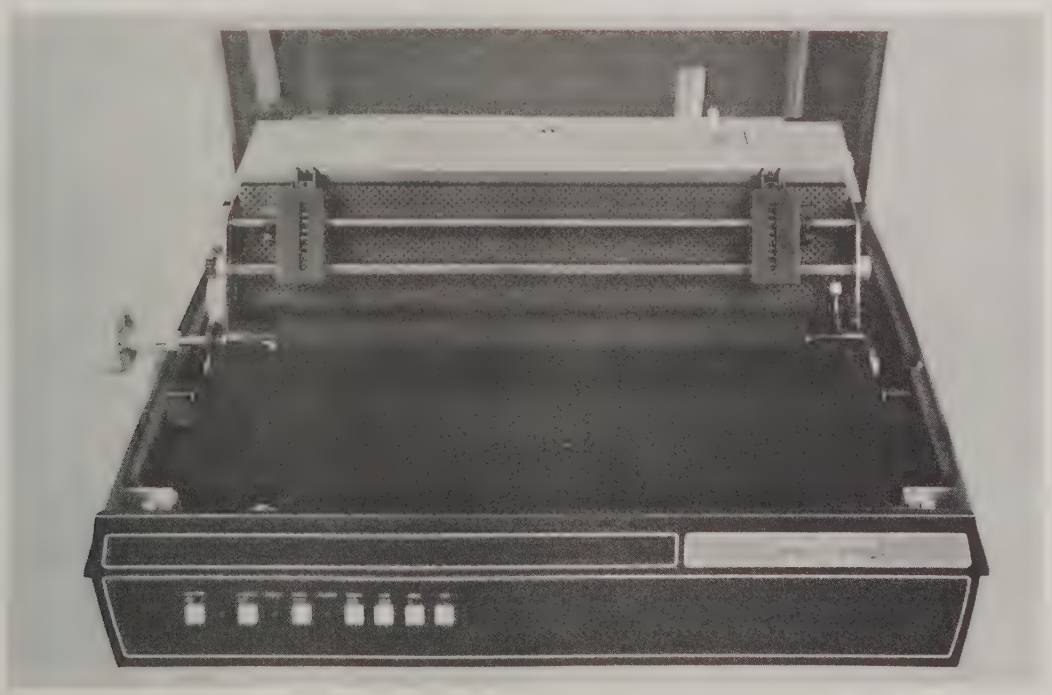
RIBBON DRIVE

The ribbon drive mechanism is driven from the left print belt pulley shaft through a series of reduction gears. A clutch is employed on one end of the ribbon drive shaft to insure only counter-clockwise movement of the shaft. A drive coupling on the other end of the drive shaft engages a hub in the ribbon cartridge which is specially designed to break in the event that the ink ribbon would hang up or jam for any reason. This design feature protects the ribbon drive mechanism from possible damage should a ribbon jam or other similar malfunction occur. The ink ribbon is in the form of a long Mobius loop housed in a plastic cartridge which snaps in place over the Hammer and Print Belt Assembly (see Figure 4-3).


Jackshaft
Motor
Line Feed Clutch
Left Drive Belt Drives Hammer and Print Belt, and Ribbon Drive Mechanism
Right Drive Belt Drives Jackshaft
Print Belt Movement

PLH-6113

Figure 4-2. Drive Mechanism



PLH-6116

Figure 4-3. TermiNet 340 Printer Showing Ink Ribbon Cartridge Installed

Through the coupling arrangement, the ribbon is driven continuously whenever the motor is running so that it will pass from right to left behind the type fingers. Every ink ribbon cartridge contains a manual ribbon drive knob which can be rotated manually to drive the ribbon inside the cartridge. This feature permits operators to remove any ribbon slack by making the ink ribbon taut which allows for easier cartridge installation.

HAMMER AND PRINT BELT ASSEMBLY

The TermiNet 340 Line Printer (see Figure 4-4) uses a flexible belt to carry the type fingers used for printing. The fingers are mounted in vertical slots in the belt. Each finger has a type character or symbol embossed on the upper end. A two font belt holds two sets of 96 characters. A three font belt holds three sets of 64 characters. The fingers can be replaced by lifting them vertically out of the finger slot in the belt. Note that two or three of the fingers (font fingers) are special index fingers and cannot be removed from the belt. These fingers are wider at the bottom and serve as a reference point to trigger an electronic counting circuit used in the hammer and print finger acutation.

The print belt is driven by an AC motor and belt-drive system. The print belt travels counter-clockwise (as viewed from the top) at a constant rate in front of the paper and platen. An inking ribbon passes between the type fingers and the paper. Printing takes place when a typefinger is driven by a hammer against the ribbon and paper.

The position of each character in the belt is relative to the special wide index finger which is detected by the photoelectric light beam. This wide index finger triggers an electronic counting circuit which counts the finger movement of the belt. As the fingers in the belt move past each possible print column position, the column position is compared with the stored input data to determine when the finger is in the correct position. When this comparison indicates that the selected character is in the correct column position, the appropriate hammer is fired. There is a hammer in each print position (column), for a total of 132.

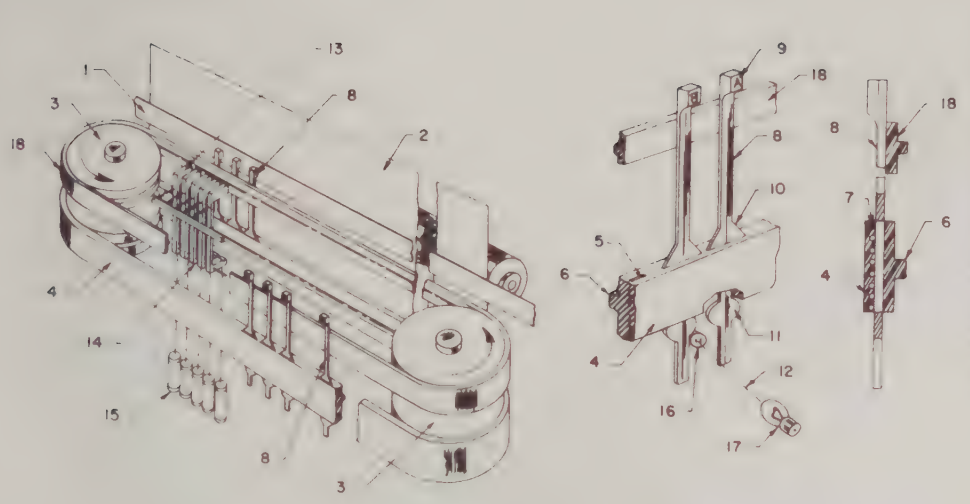
All of the individual hammers (see Figure 4-5) are mounted on a common pivot rod. Each hammer is connected by its clevis to a solenoid plunger. The clevis engages a curved slot at the base of the hammer. The other end of the clevis is linked to the solenoid plunger. When the solenoid coil is energized by the hammer drive circuit, the clevis is pulled down by the plunger, causing the hammer to pivot forward about the pivot rod. The face of the hammer travels forward approximately .077 inch (2.0 mm) while being pulled by the clevis. The curved slot at the base of the hammer serves a dual purpose. It provides an easy means for disconnecting the clevis and allows a means of overtravel (free-flight) for the hammer.

The actuation of a hammer against a print finger is electronically controlled by a timing process which uses an electronic buffer storage and counting system. When a character printout is selected by input data, the Printer buffers or stores the input data and permits multiple hammer firing when selected fingers are in the correct position.

The solenoids are mounted and spaced uniformly in banks on the coil bar assemblies. There are four coil bar assemblies mounted parallel to each other with an angular displacement. Each coil bar assembly consists of a top and bottom piece and two side pieces. The bars are supported at the ends by the belt pulley castings.

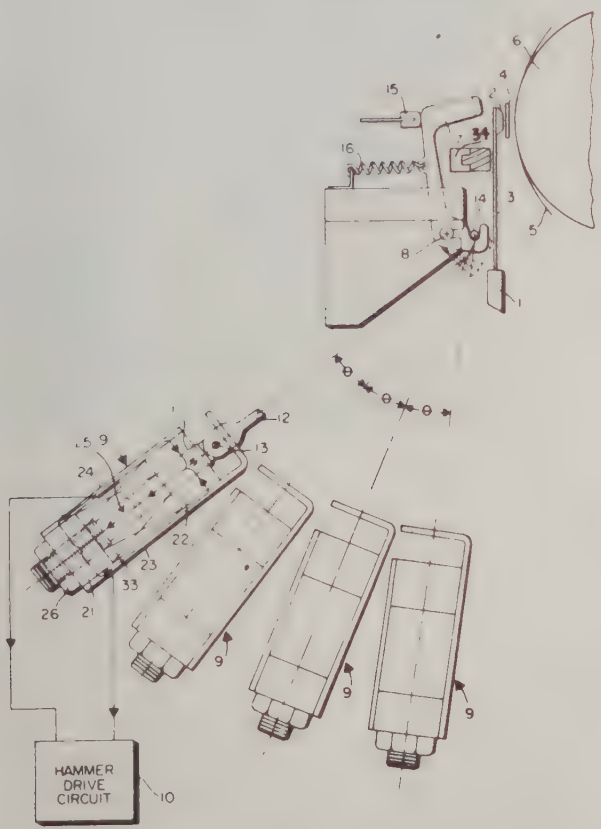
The solenoid plunger enters a hole in the top member of the coil bar. The bottom portion of the coil bar has a threaded hole to receive a threaded solenoid pole piece. The penetration of the pole piece in the coil bar is adjustable, and its position or depth is secured by a locking nut. This allows a travel adjustment of the upper plunger. The timing process of actuating a hammer is effected by the photocell position. The time from coil energization to hammer strike is approximately 1.3 milliseconds. Whe the hammer is at rest, it is held against the hammer backstop bracket by the hammer spring.

A narrow belt which rotates about a second set of pulleys directly on top of the print belt pulleys, serves as a traveling rebound belt for the print fingers (see Figure 4-4). The traveling rebound belt along with the rebound bar acts as a stop for a finger after a character has been printed. This prevents the fingers from oscillating and snagging on the hammers.



PLL-5046

Figure 4-4. Hammer and Print Belt Assembly



1 Print Belt
2 Type Face
3 Print Finger
4 Inking Ribbon
5 Paper
6 Platen
7 Hammer
8 Pivot Rod
9 Coil Bar
10 Hammer Drive Circuit
11 Solenoid Plunger
12 Clevis
13 Clevis Pin
14 Clevis Pin
15 Hammer Backstop Bracket
16 Hammer Spring
21 Coil Bar, Bottom
22 Coil Bar, Top
23 Coil Bar, Side
24 Coil Bar, Side
25 Pole Piece
26 Nut
33 Coil Winding
34 Rebound Bar and Rebound Belt

PLL-5047

Figure 4-5. Hammer Actuation Mechanics

PAPER HANDLING

GENERAL

Fan-fold type paper, punched along the edges for pin feeding is supplied to the TermiNet 340 Line Printer through either a front or a rear paper entrance.

CAUTION

Multiple part forms must always be supplied from the front paper entrance.

The paper is moved through the Printer by means of a Paper Handler which consists of a right and left paper tractor, a tie rod, and a drive shaft.

A paper out switch located at the rear of the hammerbank and beneath the left end of the platen senses a paper out condition and causes an "alarm" condition to exist. This causes the Printer motor to stop and the ALARM light to light. The Printer motor cannot be turned back on until the paper out condition is cleared.

In addition to the paper out switch, a sensor is available which can be enabled to sense a low paper condition. The standard low paper sensor is mounted on the rear paper entrance pan. An optional front low paper sensor can be located outside the pedestal cover just under the front of the Printer. When a low paper condition is sensed, a signal is sent to the Interface circuit board. Depending upon which particular Interface circuit board is being used, one of several actions may be taken: an "alarm" condition may be triggered; an indicator may be turned on, or the data source may be alerted and no Printer action taken.

PAPER TENSION

Tension is applied to the paper through the use of a paper tensioner. The paper tension is controlled by a lever which can be placed in one of two positions. Placing the lever in the LOAD (L) position allows paper to be installed, and disables the Printer motor circuit. Placing the lever is the RUN (R) position applies tension to the paper and enables the Printer motor circuit.

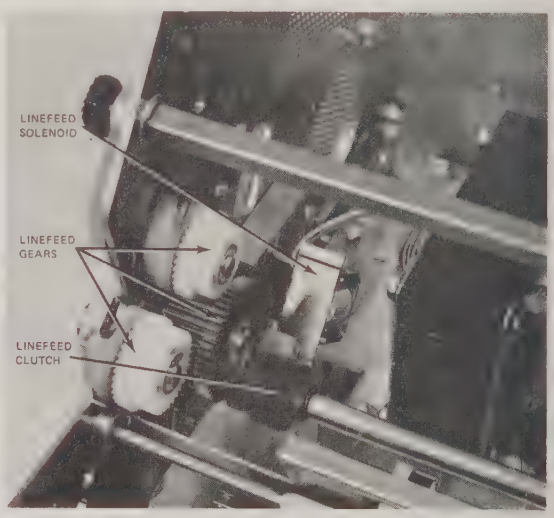
LINE FEED

Paper advancement is accomplished by manually rotating the platen knob or by electrical/mechanical feed. When advancing the paper manually the platen knob is pushed in. This disengages the platen gears from the gears connected to the line feed clutch and allows the platen to be moved manually with the platen knob.

NOTE

The platen knob will not rotate in the reverse feeding direction.

The line feed solenoid and line feed clutch are the components used for normal line feeds (see Figure 4-6). When a line feed is selected, the line feed solenoid is energized with +25 volts for 12.5 milliseconds. This pulls the line feed solenoid arm away from the line feed cam allowing the clutch to rotate 1/3 of a revolution. This causes gears connected to the line feed drive gear to advance the paper one line. (The anti-backlash spring holds the line feed clutch securely in position and prevents clutch oscillation and wear.)



PLL-6102

Figure 4-6. Line Feed Mechanics

VERTICAL FORMATING

The Vertical Format Unit (VFU) option consist of a photoelectric tape reading device which is mounted on the left side frame of the Printer. The associated electronics (connected through cabling) are located on the Logic (LOG) board. The optional VFU device provides a fast means for advancing paper in the Printer to predetermined positions when appropriate paper action codes are received from the data source.

A preprogrammed tape loop is used to control the VFU. When a Vertical Tab code is received, the linefeed clutch will be activated, as described previously for line feeding, causing paper to start feeding at a rapid rate. At the same time, the pre-programmed tape loop will start feeding through the VFU tape reader, and will continue feeding until a VT "stop" (programmed in the tape) is sensed by the photoelectrics. This will cause the linefeed clutch to deactivate, stopping paper advancement and VFU tape motion.

The same procedure as stated for Vertical Tabulation is used for Form Feeding except that a programmed FF "stop" in the tape will stop paper advancement.

CAUTION

Use only opaque (black or Mylar) tape in the VFU.

SECTION 3

PRINTED CIRCUIT BOARDS

HIGH VOLTAGE SWITCHER BOARD (HVS) 44C417519

FUNCTION

Two HVS boards are used in the TermiNet 340 Line Printer. Each board is identical to the other one. The HVS boards installed in the even HVS and odd HVS bustle positions control voltages used for firing all of the even and odd hammers respectively. The G02 HVS boards differ from the G01 HVS boards only by the type of certain transistors used. Functionally, the G02 boards are identical and completely interchangeable with the G01 boards.

Each HVS board also provides protection against over current or over voltage to protect the hammer coils.

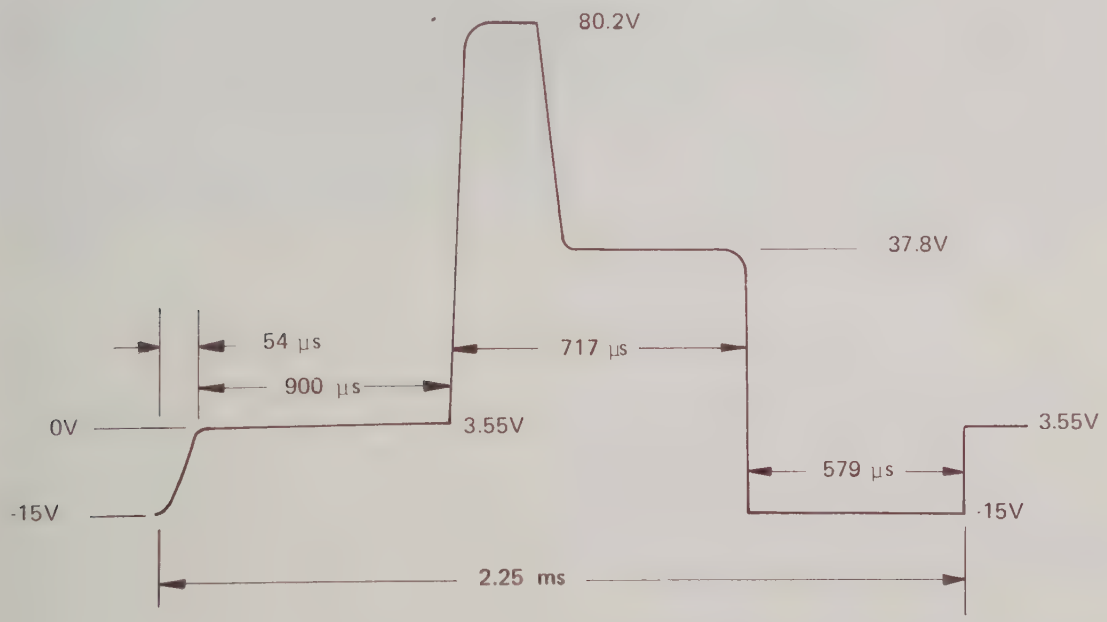
FUSES - None

STRAPS - None

TEST POINTS AND WAVEFORMS

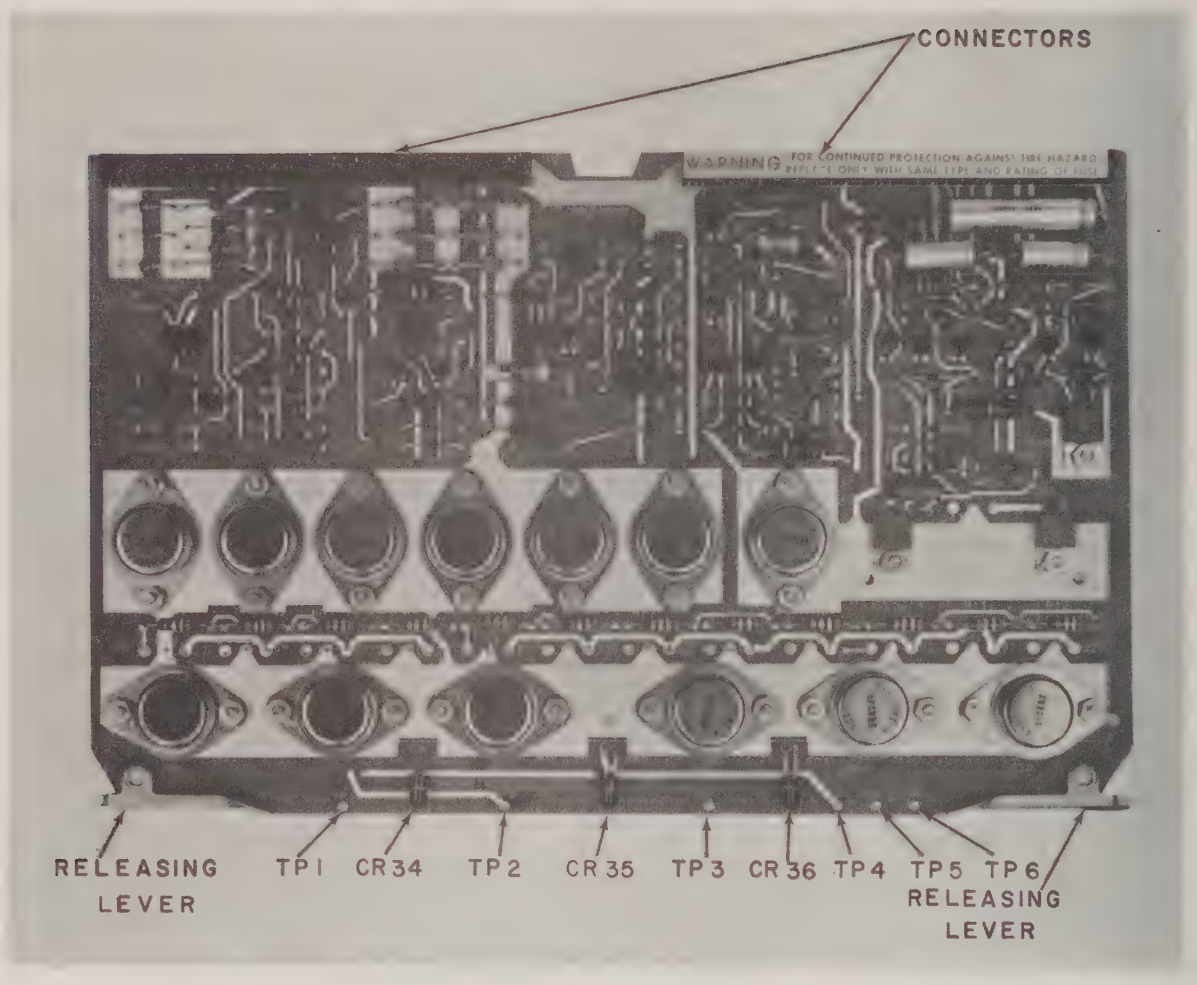
TP1 - Crowbar

TP2 - EHD (or OHD) Bus Output Voltage. Use TP4 (0V) to reference scope to ground. With test probe on TP2, adjust sweep to observe the following trace.



TP3, TP5, and TP6 - For factory use.

TP4 - 0V



PLL-5049

Figure 4-7. High Voltage Switcher Board (HVS)

PRINCIPLES OF OPERATION (Figure 4-8)

The HVS PCB receives 3 signals from the LOG board (commutate, drive and fire), one signal from PSR (LVS), and several DC voltages from PSR (+109, +15, -15, -25). The HVS processes the above signals to produce a stepped waveform of voltage which is applied to a Hammer Drive Bus (EDB or ODB).

When the print belt is running, the output of one HVS should be as shown above for TP2.

The two input signals (Drive, Commutate) from the LOG PCB perform the following function on HVS. If both Drive and Commutate are off, the input circuits tell the Op Amp to keep the output voltage at the Compare level, approximately 3.5 volts.

When the Drive signal is applied, the input circuits initially tell the Op Amp to cause the output voltage to be approximately 80 volts; then, after a delay of 225 μs, the output voltage should drop to 38 volts and stay there until the Commutate signal is applied.

When the Commutate signal is applied, the HVS output voltage goes to approximately -15 volts. It should be noted that the Commutate signal has priority; that is, the Commutate signal forces the

output to -15 volts regardless of what the Drive signal is. The HVS output voltage is forced to -15 volts by the Pull-Down circuit.

The Op Amp itself cannot supply the voltage necessary for the output; therefore, the Op Amp is followed by a stage having a voltage gain of 11. Now sufficient voltage is available but the power is too low.

The power is stepped up in a 4 stage emitter follower. This constitutes the power amplifier.

The protection circuits use a FIRE signal from LOG and a Current Detect signal from the Power Amp to detect repetitive hammer fire (LHD SCR shorted). The protection circuits also detect instantaneous overcurrent and bus overvoltage.

VISUAL INDICATORS

With normal operation CR34 (left side LED) should not glow; CR34 will glow whenever a CBAR output exists.

In normal Printer operation CR35 (center LED) will glow continuously when the print belt is running; otherwise it should not glow.

CR36 (right side LED) will flash intermittently as data is being printed. If no data is being entered, CR36 should not flash.

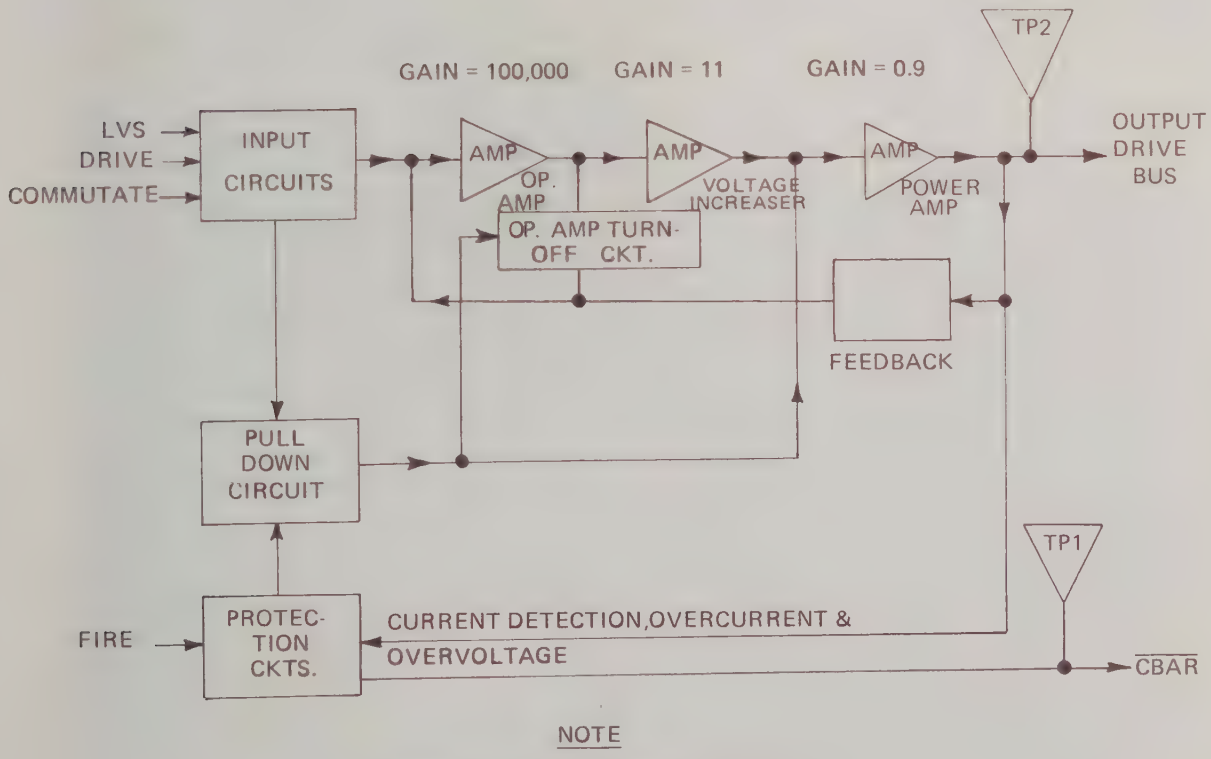


Figure 4-8. High Voltage Switcher Board (HVS)

LINE HAMMER DECODER BOARD (LHD)
44C417513

FUNCTION

The two LHD boards used in the TermiNet 340 Line Printer are identical to each other. Each board controls hammer firing of all odd hammers or all even hammers depending on which bustle slot the board is inserted.

The LHD boards contain an SCR for each hammer position. The fire even (FEH) and fire odd (FOH) signals along with the decoded hammer drive signals which originate on the Logic (LOG) board are received on the LHD boards. These signals are used to control the "turning on" of selected SCR's energizing the associated hammer coils.

Voltages required for switching the SCR's and conducting the solenoid coils are supplied to the LHD boards by the High Voltage Switch (HVS) boards.

FUSES - None

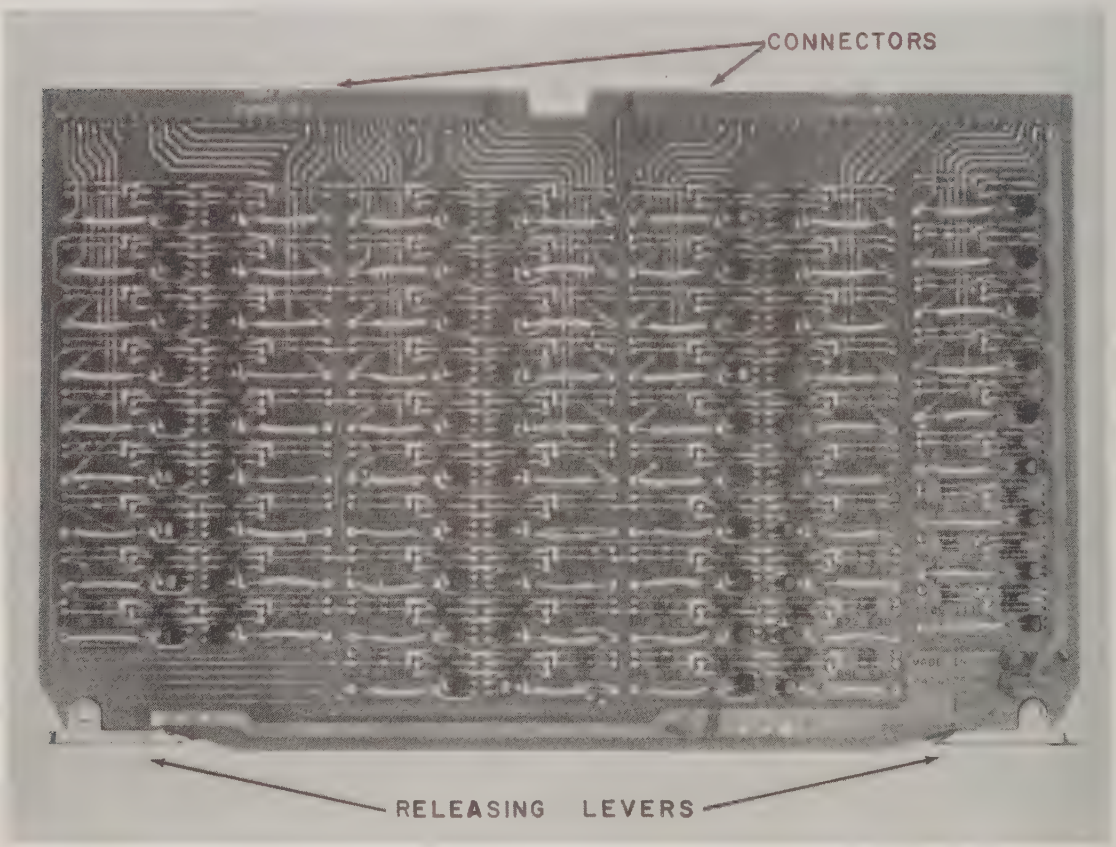
STRAPS - None

TEST POINTS AND WAVEFORMS - None

PRINCIPLES OF OPERATION (FIGURES 4-10a TO 4-10d)

GENERAL

The Line Hammer Decoder PCB's accept the decoded hammer drive signals from the Column Counter & Decoder (CCDE) logic located on the Logic (LOG) PCB for subsequent decoding that enables the individual hammer solenoid circuits. The LOG PCB also provides two differentiating signals that identify whether the hammer solenoid circuit to be enabled is an even or an odd print position. Within a cycle time of approximately 2.2 milliseconds, up to 30 hammer solenoid circuits can be enabled, fired, and turned off. Since the one group of even hammer solenoid



PLL-5051

Figure 4-9. Line Hammer Decoder Board (LHD)

circuits are being enabled during the firing and subsequent turn-off of a group of odd hammer solenoids, then the two LHD logic arrays, through an interlace pattern, can print up to 60 characters in 2.25 ms under optimum data transfer.

COMPARISON CYCLE

During a 900 microsecond period, up to 30 comparisons are made of the hammer drive signals from the LOG PCB. The hammer drive signals consist of two groups. The one group is in increments of 16 to enable a series of eight odd or eight even gate circuits, while the other group is in increments of two to enable one odd or one even gate circuit within the group of sixteen. The incremented-by-16 hammer drive signals are $\overline{H0}$, $\overline{H16}$, $\overline{H32}$, $\overline{H48}$, $\overline{H64}$, $\overline{H80}$, $\overline{H96}$ and $\overline{H112}$. The incremented-by-2 hammer drive signals are $\overline{HZ}$, $\overline{H2}$, $\overline{H4}$, $\overline{H6}$, $\overline{H8}$, $\overline{H10}$, $\overline{H12}$ and $\overline{H14}$.

To differentiate whether the comparison is for a group of even or a group of odd hammer solenoid circuits, the Belt Counter & Comparer (BCOM) circuits on the LOG PCB provides two signals, Fire Even Hammer (FEH) and Fire Odd Hammer (FOH), thus enabling the LHD gate circuits on the one LHD PCB. Then during the subsequent comparison cycle, enabling the LHD gate circuits on the alternate LHD PCB. Therefore, since either all even, or all odd enabling comparisons occur at any given time, up to 30 even comparisons can be made during the 900 microsecond comparison period. During these alternate interlace periods, up to 30 odd comparisons can be made. The LHD PCB in the odd bustle slot is enabled by the FOH signal, while the LHD PCB in the even bustle slot is enabled by the FEH signal. Thus all odd hammer solenoid decoding gates are located on the LHD/ODD PCB and all even hammer solenoid decoding gates are located on the LHD/EVEN PCB.

To decode at the gate to an SCR for enabling during the comparison cycle, three signals must be present simultaneously. These signals are one of the incremented-by-16 hammer drive signals, one of the incremented-by-2 hammer drive signals, and, if an even print position is to be enabled, the FEH signal. If an odd print position is to be enabled, then the FOH signal would be required. Therefore, although both an even and an odd print position have the same hammer drive signals present simultaneously, the FEH and FOH signal differentiates whether the even or odd gate will be enabled to switch on the SCR controlling the conduction path through a hammer solenoid.

During the comparison cycle, the odd, or even group of decoder circuits will have a positive voltage of approximately 3.5 volts present on the anode of the SCR. The cathode of the SCR is connected to 0 volts potential. Thus, if the gate circuit connected to the SCR gate is enabled by the correct hammer drive signals and the correct differentiating control signal, FOH or FEH, then a positive potential is felt at the SCR gate, switching the SCR into the conduction state. This low voltage (3.5 volts) does not provide sufficient power through the hammer solenoid to cause the hammer to be thrown. Therefore, since all the even, or all the odd SCR's will have this small voltage level applied during the comparison cycle, as the hammer drive signals are generated and decoded, the SCR's of an even group, or the SCR's of an odd group, can be switched on, one at a time, during the comparison period. Hence, during optimum data transfer periods, up to 30 SCR's can be switched on during a comparison period. When the accelerate voltage, approximately +109 volts, is applied to the selected group of SCR's, the 30 hammer solenoids through which a conduction path exists will be simultaneously energized, causing the corresponding hammers to be thrown forward.

ACCELERATE AND HOLD CYCLE

Following the comparison cycle, the accelerate and hold cycle occurs. The accelerate period is for a period of 225 microseconds followed by the hold period of approximately 495 microseconds, for a total of approximately 720 microseconds. During this time the SCR's selected during the comparison cycle will have +109 volts applied at the anode, causing a high current conduction path to exist through the corresponding hammer solenoid. This will pull the selected hammers forward. Once the pull of the hammer is started, the initial high potential necessary to initiate the action is reduced to a potential of approximately +37.8 volts, sufficient to provide a continued pull on the hammer to generate the necessary motion to throw the hammer forward for printing.

The timing of the application of this voltage potential is coordinated by the BCOM logic on the LOG PCB so that the print fingers are in the proper location to provide the correct print character to appear at the proper time on the print belt during application of the accelerate voltage to a particular SCR. This will then enable multiple character printing along the line of print as a result of the correct decoding by the LHD gate logic.

COMMUTATE CYCLE

After the accelerate voltage drops to +37.8 volts, the hold period is terminated by the action of commutating the hammer solenoid voltage to -15 volts. This will reverse bias the SCR anode to cathode potential, stopping the conduction path through the SCR. The commutate cycle is approximately 580 microseconds in duration.

At termination of the commutate cycle, the hammer drive bus voltage level returns to the comparison cycle voltage level of approximately +3.5 volts. This enables passing the selected SCR circuits through another comparison cycle, and repeating the cycle of events described. Control of the voltage level switching is on the High Voltage Switch (HVS) PCB's.

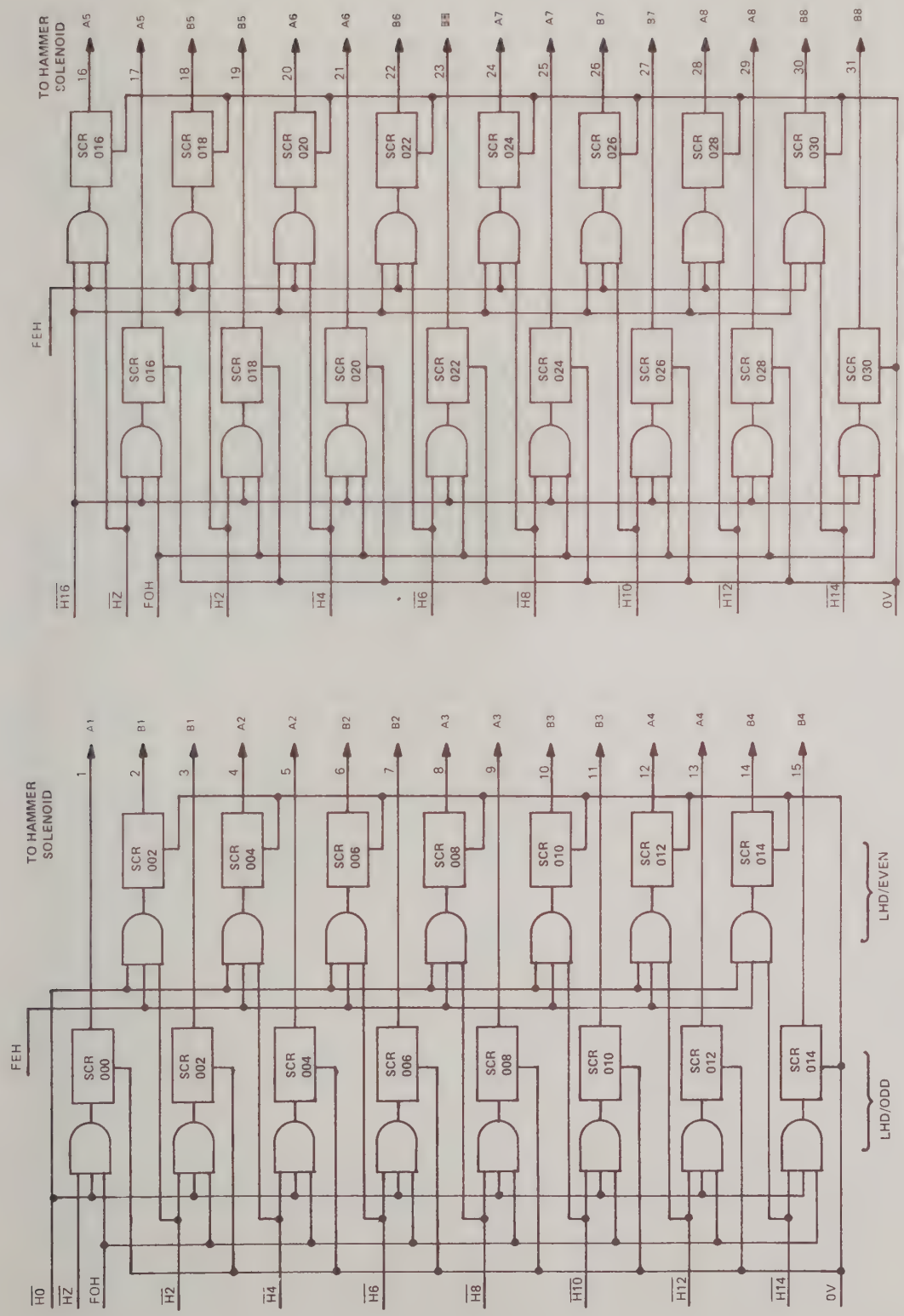
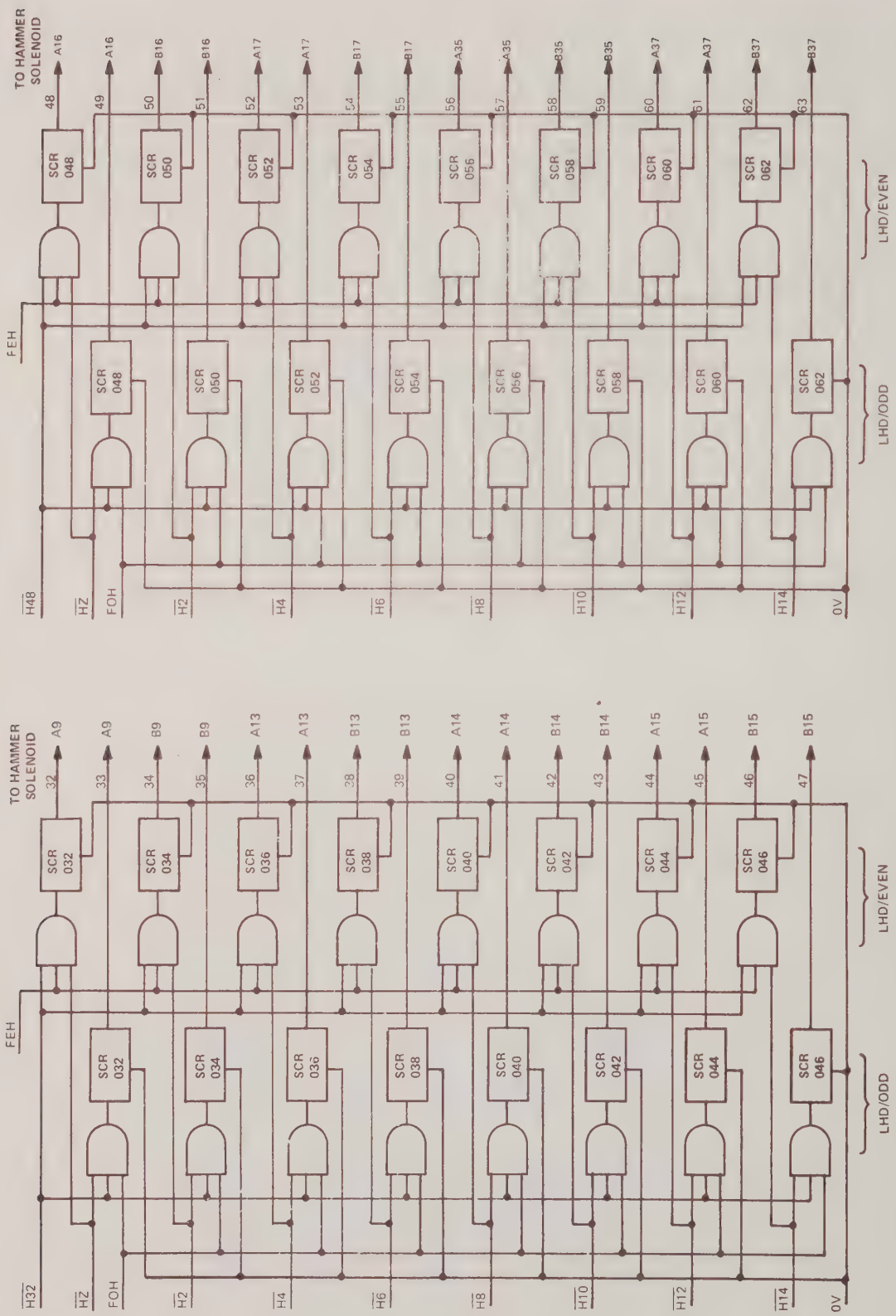
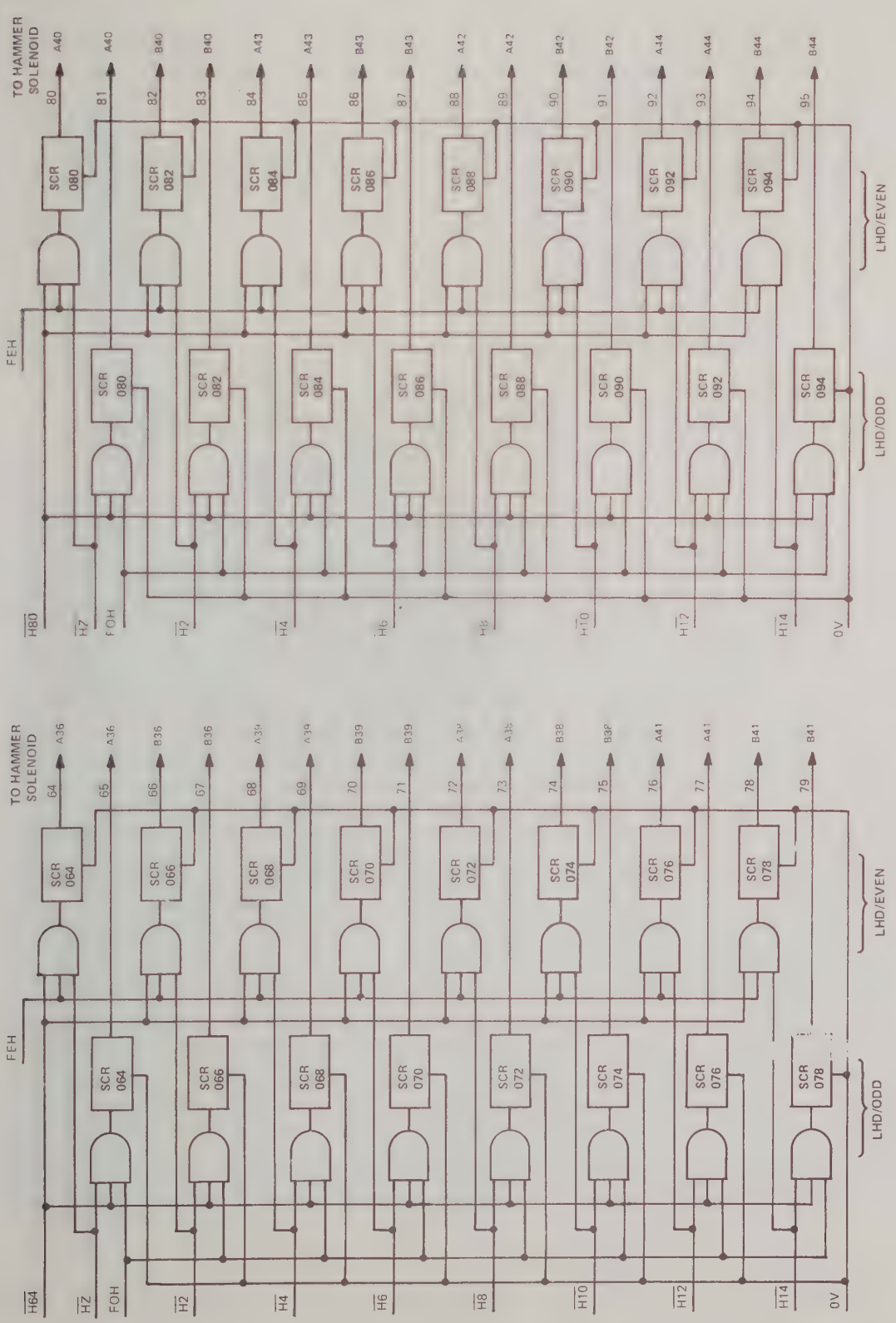


Figure 4-10a. LHD Board Circuits for Hammers 1-31



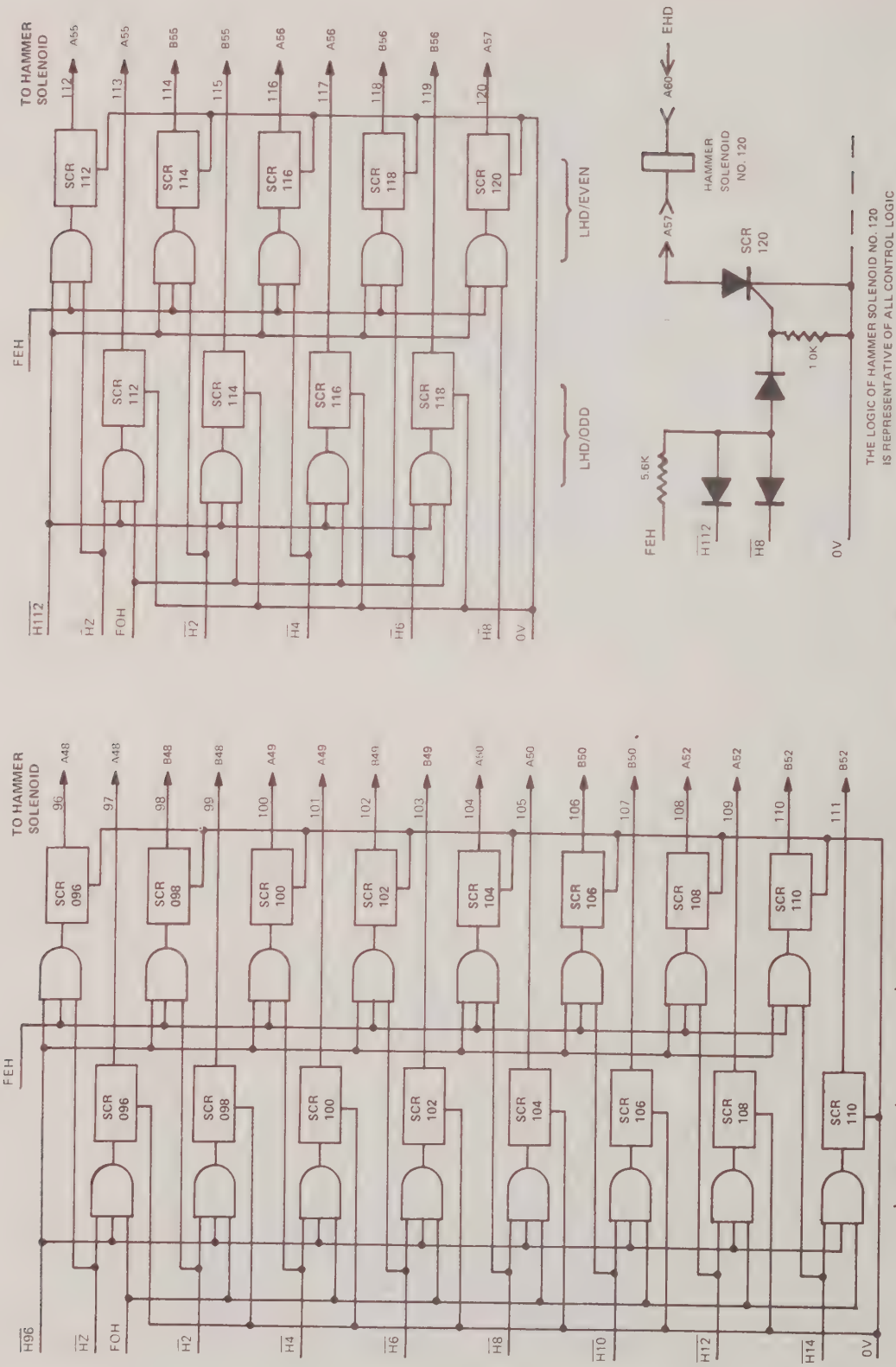
PLL-5053

Figure 4-10b. LHD Board Circuits for Hammers 32-63



PLL-5054

Figure 4-10c. LHD Board Circuits for Hammers 64-95



NOTE - Hammer solenoids 121, (122/123), (124/125), (126/127), (128/129), (130/131), and 132 correspond to pin numbers A57, B57, A58, B58, A59, B60 and A60 respectively.

PLL-5055

Figure 4-10d. LHD Board Circuits for Hammers 96-120

POWER SUPPLY REGULATOR BOARD (PSR) 44C417520

FUNCTION

The PSR board receives raw, unregulated DC voltages from the rectifiers on the XPS board. Functions performed by various circuits on this board are as follows.

1. Regulates the four low voltage (+15, +5 -15, and -12 volt) power supplies.

2. The crowbar circuit turns off the high voltage supply in case of overcurrent detection.

3. Regulates the high voltage +157V unregulated DC power from the XPS board. The output of the high voltage regulator is 109V.

4. The protection circuits sense for high or low voltage conditions.

5. The photoelectric sensing circuits pick up and amplify signals from the print finger phototransistors.

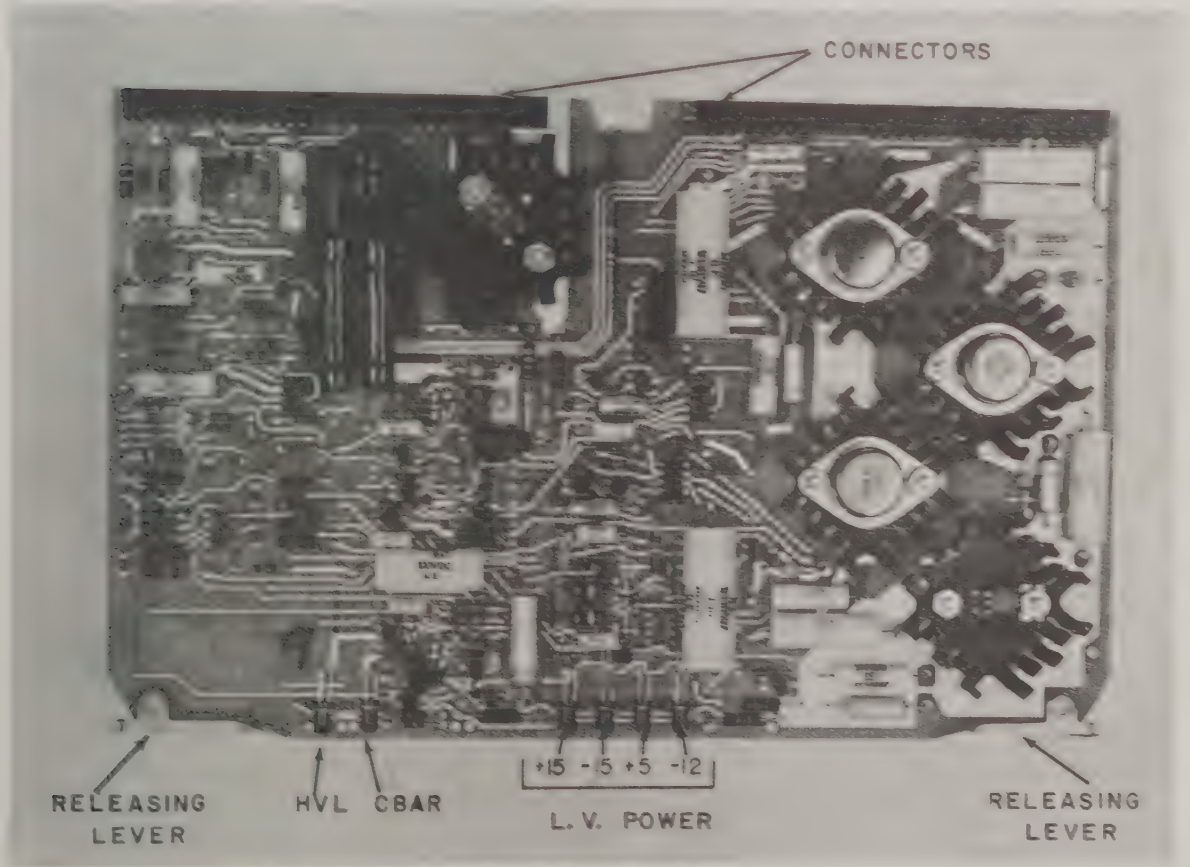
FUSES - None

STRAPS - None

TEST POINTS - None

PRINCIPLES OF OPERATION (FIGURES 4-12a, 4-12b)

The four low voltage regulators receive low voltage unregulated power from the rectifiers on the XPS board. These low voltage regulators contain built-in



PLL-5056

Figure 4-11. Power Supply Regulator Board (PSR)

protection against shorts, overvoltage, and heat build-up.

CAUTION

WHEN OPERATING A PSR BOARD ON AN EXTENDER BOARD WHILE TROUBLESHOOTING, HEAT WILL BUILD UP RAPIDLY WITHOUT BENEFIT OF THE COOLING FAN. THIS MAY CAUSE THE REGULATORS TO TURN OFF WHEN THEY BECOME OVERHEATED. AFTER A COOLING OFF PERIOD, THEY WILL RETURN TO NORMAL OPERATION.

The high voltage regulator is inputted by the +157 volt unregulated supply on the XPS board. This regulator contains a "soft start" feature which limits power in-rush. The high voltage regulator along with associated protection circuitry will generate a crowbar signal when the 109V supply drops below 95V or reaches 120V. The high voltage sensing circuit compares the 109V supply with the -5.6V reference voltage.

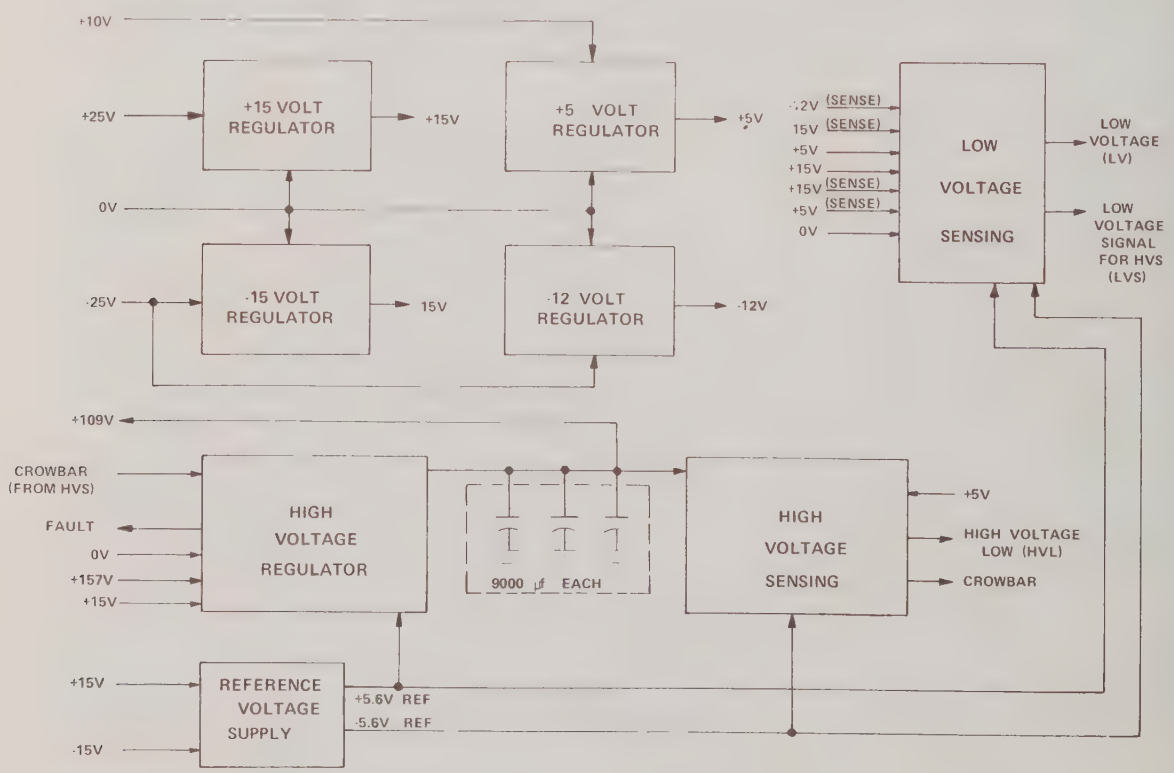
Low voltage sensing circuits monitor the low voltage supplies for correct voltage levels. These protection circuits consist of four integrated circuits which are used for comparing the four low voltage power supplies with the two reference voltages. When a supply goes low, the output signal LVS is sent to the two HVS boards which has the same effect as the commutate signal.

Status indicators located on the PSR board indicate the following abnormal conditions --

DS1 (HVL)	- High Voltage Low Signal
DS2 (CBAR)	- Crowbar Signal
DS3 (+15)	- +15V Supply Low
DS4 (-15)	- -15V Supply Low
DS5 (+5)	- +5V Supply Low
DS6 (-12)	- -12V Supply Low

PHOTOELECTRIC PRINT FINGER SENSOR (FIGURE 4-12b)

The print finger sensor consists of two light emitting



PLL-5057

Figure 4-12a. Power Supply Regulator Board (PSR)

diodes and associated phototransistors. These devices are mounted in such a way that each moving print finger will interrupt a light path from a LED to the associated phototransistor. Circuits which shape and amplify the outputs of the phototransistors are located on the PSR board. To lengthen the life of the LED's, the Motor signal $\overline{MTR}$ is used for turning the LED's off when the print belt stops running.

LOGIC BOARD (LOG) 44C417521

FUNCTION

The LOG board performs three principal operations. It contains circuits for controlling the motor, printing, and paper handling. All timing signals used in the Printer also originate from this board. The LOG board has been designed with the necessary flexibility to accommodate the various options available for the TermiNet 340 Line Printer.

FUSES

F1 = 1/8A PICO, Phase 1 Clock
F2 = 1/8A PICO, Phase 2 Clock

STRAPS

J4 to 80 - 80 column operation
J4 to 132 - 132 column operation

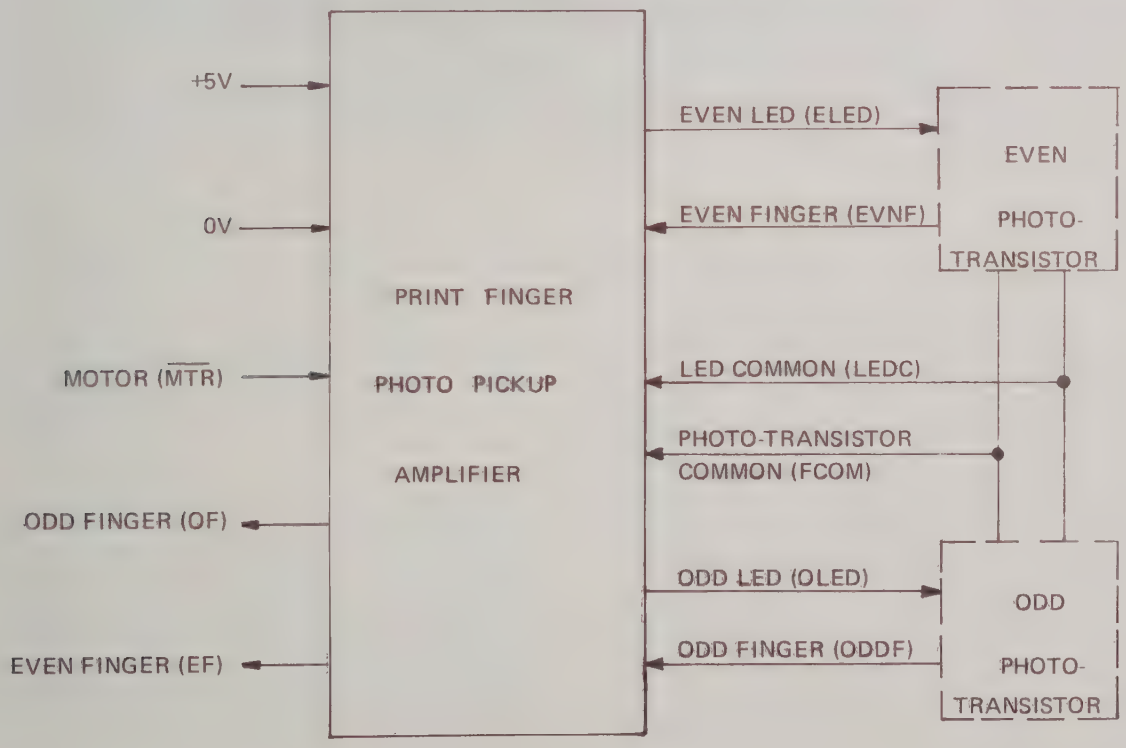
TEST POINTS AND WAVEFORMS

TP1 = VTFF voltage

PRINCIPLES OF OPERATION (FIGURES 4-14a, 4-14b)

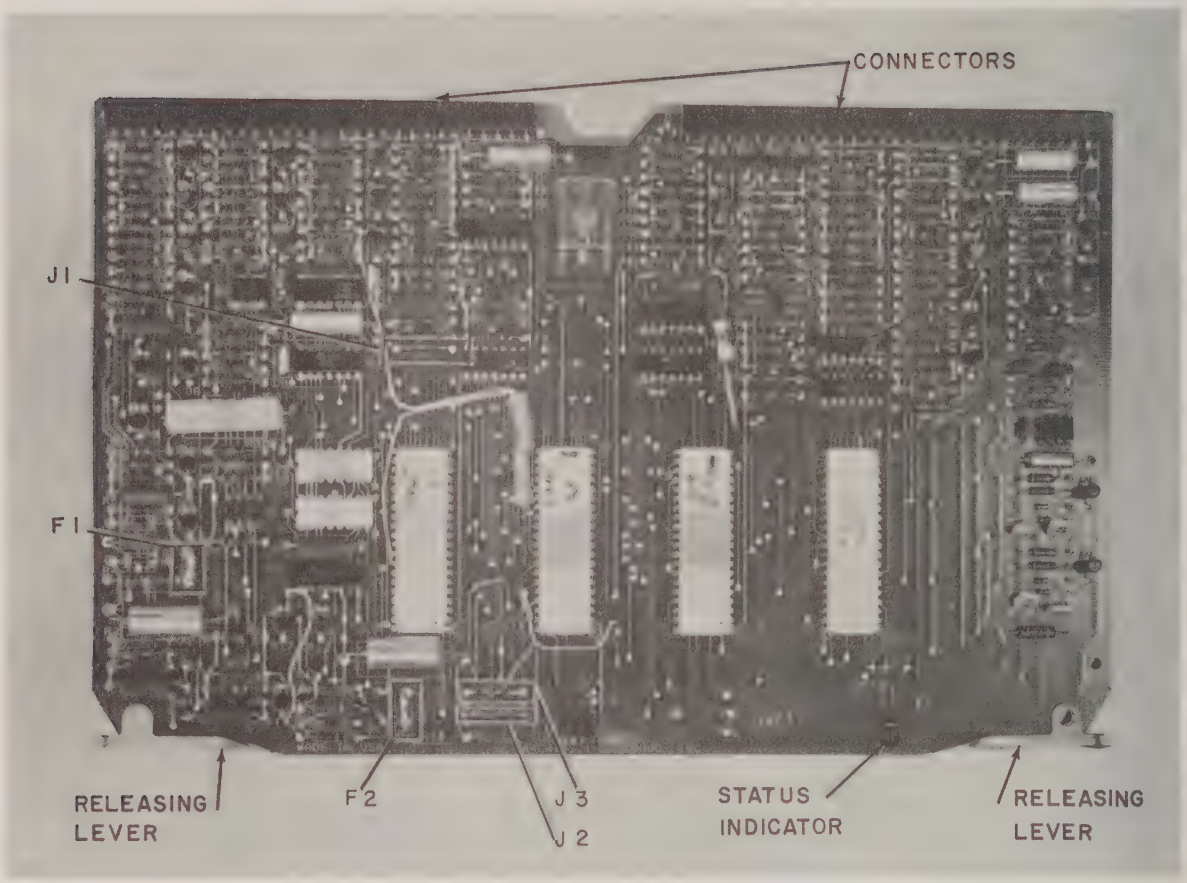
INTRODUCTION

The Line Printer Logic Board (LOG) contains the circuitry associated with processing parallel data from the interface (INT board) to the Line Printer print mechanism. This includes processing data to a one-line memory until a full line (80 or 132 characters) has been stored. Upon completion of line storing, the Printer will begin the print cycle which will involve printing the characters in the memory in the correct columns (print positions) at the correct time. As characters are stored in the memory, a column counter will advance in synchronism with the



PLL-5058

Figure 4-12b. Photo-electric Sensor on PSR Board



PLL-5059

Figure 4-13. Logic Board (LOG)

character memory. When characters are read out of the memory, the column counter will advance again in synchronism with the character memory such that the character being read out will have its associated column being read out (from the column counter) at the same time. When the print belt is in the correct position, the column being read from the column counter will cause the activation of that particular hammer solenoid in the hammerbank assembly.

Paper handling logic is also contained on the LOG board. The recognition of a VT, FF, LF, Slew, VT & LF or FF & LF will cause the LOG board to initiate paper slewing. This portion of the LOG board will work in conjunction with the TVFB photosensor board housed in the Vertical Format Unit to reset the slewing sequence. This will occur after the proper number of linefeeds as dictated by a preprogrammed paper tape loop.

The Motor Control logic and the Alarm logic for the Printer is also found on the LOG board. The Alarm logic will be activated when the Printer is out of paper, when there is a slow speed on the print belt, or when there is a low voltage on any of the power supplies on PSR. A low speed detector has also been incorporated on the LOG board which will cause an Alarm condition when the print belt slows down by approximately 12% of its rated speed.

A Test Generator Circuit will cause the Printer to print out a test pattern when the Test pushbutton on the control panel is pressed. This circuit on the LOG board will feed its outputs directly to the character memory and processing will be the same as though data were received from the INT board. The test function will check all boards except the INT board and the TVFB board.

The LOG board also contains two protection circuits; the Rate Limiter and the Hit Limiter. The Hit Limiter will not allow more than 30 hammers to be driven to the platen simultaneously for the Model 340, or 8 hammers for the Model 330, 320, and 310.

This protection will prevent drawing more instantaneous current than the +109V power supply can deliver. The Rate Limiter is used to prevent excessive print rates such that after several lines of print, the character-per-second print rate will stabilize at:

510 CPS for model 340
400 CPS for model 330
255 CPS for model 320
200 CPS for model 310

Finally, the LOG board contains the clocking and timing for Printer synchronization. The timing is based on a 2 phase clock system derived from a 3.2 Mhz crystal clock oscillator.

DATA PROCESSING - THE LOAD CYCLE (FIGURE 4-I4a)

Data will enter the LOG board in parallel on lines DB1 through DB7. The data will be sensed at the INPUT DATA LATCHES. With each character sent to the LOG board, an accompanying data strobe pulse ($\overline{\text{DSTB}}$) will be sent to the STROBE CKT. The output signal (DATS) will cause the INPUT DATA LATCHES to strobe the character to the DATA MULTIPLEXER on lines DX1 through DX7.

Paper Control Character

If the character being sent to the INPUT DATA LATCHES is the paper control character, it will not be accompanied by a $\overline{\text{DSTB}}$ pulse. The data will be lost unless it satisfies the condition on INT as a slew command. In that case, a slew strobe will be sent to the INPUT DATA LATCHES. This will cause the character to be sent to the DATA MULTIPLEXER and also to the SLEW LOGIC AND COUNT network. The SSTB pulse will also be sent to the SLEW LOGIC AND COUNT such that the first six bits will enter a six bit down counter. The binary count loaded into the counter is the number of lines of paper to be fed vertically.

NOTE

The paper control character will be sent to the ONE LINE MEMORY but will not be entered due to signal TSR not being true. (TSR is dependent on DSTB.)

Upon entering a slew count, the signal SLG + 32 will come true to the $\overline{\text{LFG GEN}}$ circuit, and line slewing will occur immediately. As the paper tape loop is fed through the Vertical Format Unit, each sprocket hold sends a signal $\overline{\text{SPKT}}$ from the TVFB board which counts down the slew counter by one increment. When the counter reads zero, paper slewing will stop since SLG + 32 will go false. The T - 32 input to the SLEW LOGIC AND COUNT network will cause pulses on SLG + 32 each T - 32 time. While paper is slewing, data may be entered into the DATA MULTIPLEXER and the ONE LINE MEMORY at the transfer rate. The SSTB signal will be present only during the paper control character time as established on the INT board while the Printer is in the LOAD cycle. A low voltage (LV) condition in the power supplies on PSR will cause the slew counter to reset.

Data Strobe Circuit

Each DSTB signal from INT will go to the STROBE CKT, producing a DATS and a DSTB output. The DSTB output will go to the STROBE MUX which will output the signal TST + DS. This signal will pulse once for each $\overline{\text{DSTB}}$ received. The TST + DS signal will go to the LOAD ÷ 2 circuit. For every two data strobes, one LCTR signal will be sent to the TIMING CC LOGIC network. This will cause the signal TCC to increment the COLUMN COUNTER by 2. The counter will count in the sequence 2, 4, 6, 8, etc., through 66 and then reset to zero. The signal TST + DS will also cause the signal TSR to be sent to the ONE LINE MEMORY. A double pulse on TSR will clock 2 characters at once into the memory. It will also cause all characters in the memory to be shifted two places. This process will only occur during the LOAD cycle. Essentially, characters are loaded into the memory in pairs as the column counter counts by 2. The ONE LINE MEMORY will hold 132 characters when the COLUMN COUNTER reaches 66; or 80 characters when the COLUMN COUNTER reaches 40.

Load Logic Network

The LOAD LOGIC network will set the data loading

cycle. When $\overline{XFR}$ turns off, the LOAD LOGIC network will send the LOAD signal to enable the LOAD MUX, the INHIBIT FIRE circuit, and the LOAD FF. The LOAD MUX circuit will output a pulse every DSTB time to the END OF LINE circuit. The END OF LINE circuit will receive outputs from the COLUMN COUNTER. It will output pulses when the counter output is 40 (80 characters stored) and 66 (132 characters stored). A strap J4 will be positioned such that at one of the 2 counts, the FONT (FULL COUNT) signal will be sent to the INT board. This will cause a signal to be sent to the data source indicating a busy indication. The computer will send no more data until the print cycle is complete. Also, the INT board will turn on $\overline{XFR}$ which will be fed back to the LOAD LOGIC network to turn the LOAD signal off. This will initiate the beginning of the print cycle. When the printing of data is complete, the PC signal will turn on at the input to the LOAD LOGIC network. When the $\overline{XFR}$ turns off, the signal LOAD will again turn on and another line of data will be transferred to the memory.

Timing CC Logic Network

The TIMING CC LOGIC network will control the upward incrementing of the COLUMN COUNTER. While in the load cycle, it will perform as follows:

TCC = INFIRE AND LCTR

The RESET CC LOGIC will perform according to this equation.

RCC = INFIRE AND (LFF AND CC = 66).

The COLUMN COUNTER will reset on the count of 66 indicating that the character memory is full. The reset pulse RCC will also cause the LOAD FF to reset.

Test Generator

When the Test pushbutton on the control panel is pressed, the signal $\overline{TSTX}$ will set the TEST FF. This will cause the signal TST to be sent to the TEST GEN counter which will begin to count at the phase 2 clock rate from 32 through 127. The outputs from the counter will feed the DATA MULTIPLEXER and will be stored in character memory as with other data. The $\overline{TSTL}$ output from the TEST GEN will allow the data to pass from the DATA MULTIPLEXER to the ONE LINE MEMORY. The LOAD input must also be true. The TST output from the TEST FF will also cause the STROBE MUX network to turn on the TST + DS signal for the length of the self test. The TST + DS signal when received at the LOAD ÷ 2 circuit will cause LCTR pulses to be generated for every other count of the TEST GEN. The TSR signal will be generated by TST + DS for the length of the self test. Therefore, data characters will be entered into memory at the phase 2 transfer rate.

The TEST GEN counter will continue to count as long as TST is on. The counter will count from 32 through 127 and then reset to 32 repetitively. The ASCII printable graphics will be stored in the ONE LINE MEMORY until 191 characters have been sent. Assuming the memory to be clear, the first 132 characters will enter the memory. The COLUMN COUNTER will send one 159 pulse to the LOAD LOGIC when 59 characters have been entered into memory. When the memory is full, the COLUMN COUNTER will reset and data will be written into character memory over data previously stored until the COLUMN COUNTER outputs the next 159 pulse. The second 159 pulse will cause the LOAD LOGIC to turn off its LOAD output to begin the print cycle. Therefore, the TEST GEN circuit will have generated 132 + 59 = 191 characters, one less than the number of fingers on the print belt. When the characters in memory have printed, the PC (print complete) signal will reset the TEST FF. The PC signal will also initiate one linefeed at the LF TIMER AND LOGIC circuit. The next self test line will start one character later such that multiple lines from the self test will print a staggered character pattern.

The TST and 159 inputs to the LOAD LOGIC network will override the $\overline{XFR}$ signal from the interface. When TST turns on, LOAD immediately comes true. When the second 159 pulse arrives, LOAD will go false. The PC signal will cause LOAD to go true again.

NOTE

The self test circuit will check all circuitry in the Printer except the SLEW LOGIC AND COUNT, the $\overline{FORM}$ FF, the TAB FF, the Vertical Format Unit, and the INT printed circuit board.

PAPER HANDLING LOGIC (FIGURE 4-14a)

When the $\overline{LFX}$ signal is sensed by the LF TIMER AND LOGIC network and TST is false, the output $\overline{LFP}$ will be sent to the LFG GEN circuit. This will cause the signal $\overline{LFG}$ to be sent to the LFSO TIMER. The output pulse, $\overline{LFS}$, is amplified and sent to the XPS board as LFSO. The LFSO signal will cause the line feed solenoid to be energized for 12.5 ms to initiate an approximate 25 ms mechanical linefeed.

Feed Circuit

The $\overline{LFG}$ signal will also be sent to the FEED CKT which will output the FEED signal to the INT board. The signal FDG will also be sent to the HIT LIMIT 30 COUNTER to prevent printing during paper feeding. Finally, the $\overline{LFS}$ signal turning off will be sent to the CLP GEN circuit. This will reset the FORM FF and the TAB FF after linefeeding. This function will prevent premature triggering of a vertical tab or form feed.

Form Feed and Vertical Tabulation Circuits

When the $\overline{FFX}$ signal arrives at the FORM FF, the circuit will output the signal FFF. This will cause the $\overline{LFG}$ signal to be sent to the LFSO TIMER and linefeeding will occur if a paper tape loop is installed in the Vertical Format Unit. When an output from the Form Feed Photocell in the TVFB board arrives with a sprocket photocell pulse, the FORM FF will reset to stop linefeeding. The TAB FF will work identically. Channel "1" in the paper tape loop is reserved for Form Feed and channel "6" is reserved for Vertical Tabs. A low voltage (LV) will reset both the FORM FF and the TAB FF circuits. Again, the signals FEED and FDG will be sent to perform the same functions as described previously.

DATA PROCESSING - THE PRINT CYCLE (FIGURE 4-14a)

When the signal $\overline{XFR}$ turns on at the LOAD LOGIC network, the signal LOAD will turn off. When this happens, the Printer will immediately enter the print mode. The ONE LINE MEMORY and the COLUMN COUNTER will then be in synchronism from the load cycle. A steady double pulse on TSR to the ONE-LINE MEMORY will now be present throughout the print cycle. This will cause all characters in memory to be clocked out of the memory on output lines CH1 through CH7. These lines will feed the COMPARE LOGIC (Figure 4-14b) and also back through the DATA MULTIPLEXER into the input of the ONE LINE MEMORY on lines DTM1 through DTM7. This will continue until all characters have been printed. One double pulse (TSR) will be sent to the ONE LINE MEMORY every 8.75 μs shifting 2 characters out of the memory. The cycle time for this operation is 577.5 μs. This is less time than it takes the print belt fingers to move one print position. Thus, every other character in memory can be read by the COMPARE LOGIC before the print fingers move one print position.

Compare Logic

The printbelt moving counterclockwise will have all print fingers moving to either the odd print positions or the even print positions but not both simultaneously. Thus, the COMPARE LOGIC (Figure 4-14b) is concerned only with the characters in memory stored for even or odd columns but not both. Hence, while the print fingers are moving to even print positions, only the characters stored for even print positions will be considered. Likewise, the TSR double pulse will occur such that at the second pulse, an even-stored character will be at the COMPARE LOGIC when the print fingers are moving to even print positions. An odd-stored character will be there when the print fingers are moving to odd positions.

The COLUMN COUNTER will likewise increment steadily by two's during the print cycle. The TIMING CC LOGIC now increments on each TCC pulse which occurs once each 8.75 μs. Since it increments by two each time, it is kept in synchronism with the ONE LINE MEMORY as was true in the load cycle. The signal TCC will be sent in the print cycle according to the logic equation;

$$Ø2 = TCC = (\overline{INFIRE} + \overline{LFF}) \text{ AND } \overline{RCC}$$

The RESET CC LOGIC will send RCC to reset the COLUMN COUNTER according to the equation;

$$RCC = \overline{INFIRE} \text{ AND } CC = 132$$

Hence, the COLUMN COUNTER outputs CC2 through CC8 will have an even count being sent to the FIRE ALGORITHM LOGIC for each character being considered again at the COMPARE LOGIC.

The TIMING CC LOGIC circuit will also receive the DEF (even finger pulse) and the DOF (odd finger

pulse). Signal DEF will come true when print fingers are moving to even print positions and DOF will come true when moving to odd print positions. This will cause the signal INXO to be true during even time and false at odd finger time. The INXO pulse will be sensed by the TSR circuitry such that TSR timing will change for each finger time. When INXO is true, TSR at the ONE LINE MEMORY will double pulse to have even-stored characters at the COMPARE LOGIC. When INXO is false, TSR will cause odd-stored characters to appear at the COMPARE LOGIC.

DATA PROCESSING - THE PRINT CYCLE (FIGURE 4-14b)

The BELT COUNT circuit on LOG will count upwards from 32 through 127 and then reset to 32. It will increment upwards on each DEF pulse. The DEF pulse will arrive when the print fingers pass over the even print positions and start to the odd positions. The BELT COUNT will be sent to the FIRE ALGORITHM LOGIC on lines BC1 through BC8. This will occur at T64 time and the FIRE ALGORITHM LOGIC will hold this count until the next T64 time. The T32 time input will cause the BELT COUNT to increment if DEF is true. The signal FR (FONT RESET) will be sent when light is blocked from the even and odd photocells simultaneously. This will happen when the print belt reference tabs are in front of both photocells. The FR signal will reset the BELT COUNT to 32.

Belt Count Circuit

The print fingers are inserted into the print belt in the order used in the ASCII code. That is, the printable graphics of the ASCII code are decimal 32 through 127. Likewise, the print belt has the print finger for character 32 inserted preceding the print finger for 33 etc., through 127. This gives 96 print fingers in one print set or font. The print belt has two fonts of 96 fingers per font. This means that 192 print fingers are inserted in the print belt. Each font is separated by a reference tab which causes FR to be generated on the LOG board. The signal FR tells the LOG board to consider the next print set. It does this by resetting the BELT count to 32. The position of the photocell and the print finger spacing is such that when the BELT COUNT is 32 the 32 character print finger is in front of print position one. The finger spacing in the print belt is such that the 33 character print finger is in front of print position three and so on. When the BELT COUNT is 65, it means that the 65 character print finger is in front of print position one. Therefore, the 66 character print finger is in front of position 3 and so on. The "A" finger and "B" finger are in front of print positions one and three respectively in this example. Thus, the BELT COUNT circuit will keep track of where the print fingers are in relation to print columns or positions.

The BELT COUNT circuit will also provide a CC1 output which will be true when print fingers are moving to odd print positions (DOF) and false when moving to even print positions (DEF). This will give the odd count to the column count inputs to the FIRE ALGORITHM LOGIC when odd-stored characters and columns are being considered for printing.

Fire Algorithm Logic

The FIRE ALGORITHM LOGIC will perform an addition of the BELT COUNT outputs BC1 through BC8 and the COLUMN COUNTER outputs (Figure 4-14a) CC1 through CC8. The addition algorithm for a two font belt is as follows:

$$BC + \frac{CC}{2}$$

The column count will be divided by 2 first and then added to the belt count. If the output from the FIRE ALGORITHM LOGIC is between 32 and 127, this output will be compared with the character then present at the COMPARE LOGIC. If the BC + CC/2 = CH, a compare is the result. An output pulse will then be sent to the FIRE CKT.

Fire Circuit

If the output from the FIRE ALGORITHM LOGIC is $\geq$ 127, the binary equivalent of 96 will be subtracted from the BC+CC/2 and then compared.

When the COMPARE pulse arrives at the FIRE CKT, the output FIRE will result. FIRE will be strobed out of the FIRE CKT when FS comes true. The INHIBIT and HLIM inputs must be off. When the FIRE signal arrives at the FOH FEH GEN circuit, an FH pulse will be sent. Also, if CC1 is true (odd column) FOH will be sent to the LHD/ODD PCB. If CC1 is false, FEH will be sent to LHD/EVEN.

Erase Circuit

The outputs from the ONE LINE MEMORY are sent to two places on the LOG board other than the COMPARE LOGIC. The CH1 through CH7 outputs will also be sensed at the ERAS CKT. If the character is a control code or a space code the ERAS CKT will output the signal INHIBIT which when sensed at the FIRE CKT will cause the FIRE signal to be inhibited for that character time. Also, the output ERAS pulse will be sent to the DATA MULTIPLEXER (Figure 4-14a) to erase that character from memory. This will happen only in the print cycle (INFIRE to the ERAS CKT is off). During the load cycle, the INHIBIT signal will be true thereby inhibiting all FIRE pulses. The FIRE pulse will strobe out the signal ERAS for the printing characters.

Null Detect Circuit

The outputs CH1 through CH7 will also be sent to the NULL DETECT circuit. The NULL DETECT circuit will scan the ONE LINE MEMORY outputs CH1 - CH7 as data is being read out. Assume that the print fingers just crossed the even print positions. The signal DEF will set the NULL DETECT CKT. If there are any characters in memory, a logic 1 on any input (CH1 - CH7) will reset the NULL DETECT circuit. If there are no characters in memory, the NULL DETECT CKT will remain set. When the DOF pulse arrives it will cause the output PC (print complete) to be generated ending the print cycle. The GTD input will cause a delay in sending PC. This will occur when the Printer is in a rate limiting mode during the print cycle.

3-Font Detect Circuit

The 3 FONT DTECT circuit is used when a three-font print belt is used. With a two font belt, the signal FR will set the 3 FONT DTECT circuit. When the BELT COUNT reaches 100, the BC=100 signal will reset the 3 FONT DTECT. No output will result from the circuit. When a three-font belt is used, the FR pulse will set the 3 FONT DTECT circuit. The next FR pulse will arrive when the BC=95. In that case, the FONT 3 output will be sent to the FIRE ALGORITHM LOGIC.

When the FIRE ALGORITHM LOGIC receives the FONT 3 signal, it will change the algorithm to conform to the following equations:

IF	THEN COMPARE
$32 \leq (\frac{CC}{2} + BC) \leq 95$	$BC + \frac{CC}{2} = CH$
$96 \leq (\frac{CC}{2} + BC) \leq 159$	$BC + \frac{CC}{2} - 64 = CH$
$(\frac{CC}{2} + BC) \geq 160$	$BC + \frac{CC}{2} - 128 = CH$

Hi Lo Decode Network

The COLUMN COUNTER outputs CC1 through CC8 are also sensed at the HI LO DECODE network on LOG. As each column (print position) is read from the counter, the HI LO DECODE network will electronically switch open one HI line and one LO line. These outputs will be sent to the LHD boards. The outputs will be used in conjunction with FOH or FEH on the LHD boards to place a ground on the particular column solenoid associated with the column being read from the counter. If the CC1 - CC8 count from the COLUMN COUNTER is 38, then HI line H32 and LO line H6 will be opened momentarily. This will select coil number 38 on the even LHD board and coil 39 on the odd LHD board. The signal FEH will cause coil 38 to receive a ground and FOH will cause 39 to receive a ground. Notice that H32 + H6 = 38.

As the print belt moves from even columns to odd columns, odd coils will be grounded if the print belt is in the correct position for the characters being read from memory to print in the correct columns. This is determined by the algorithm logic. Up to 30 odd columns can receive grounds during this time. When the print fingers are almost directly in front of the odd hammers, a high voltage pulse will be sent to all odd hammer solenoids. Those solenoids that were grounded will be activated thereby printing up to 30 odd print positions simultaneously. The same sequence for printing even columns takes place when the fingers are moving from odd columns to even columns.

HVS TIMING (FIGURE 4-14b)

The Photocell PCB on the hammerbank subassembly will send electronic pulses from its photocells to the PSR PCB. The PSR board, after amplifying the two photocell outputs will send these outputs to the LOG

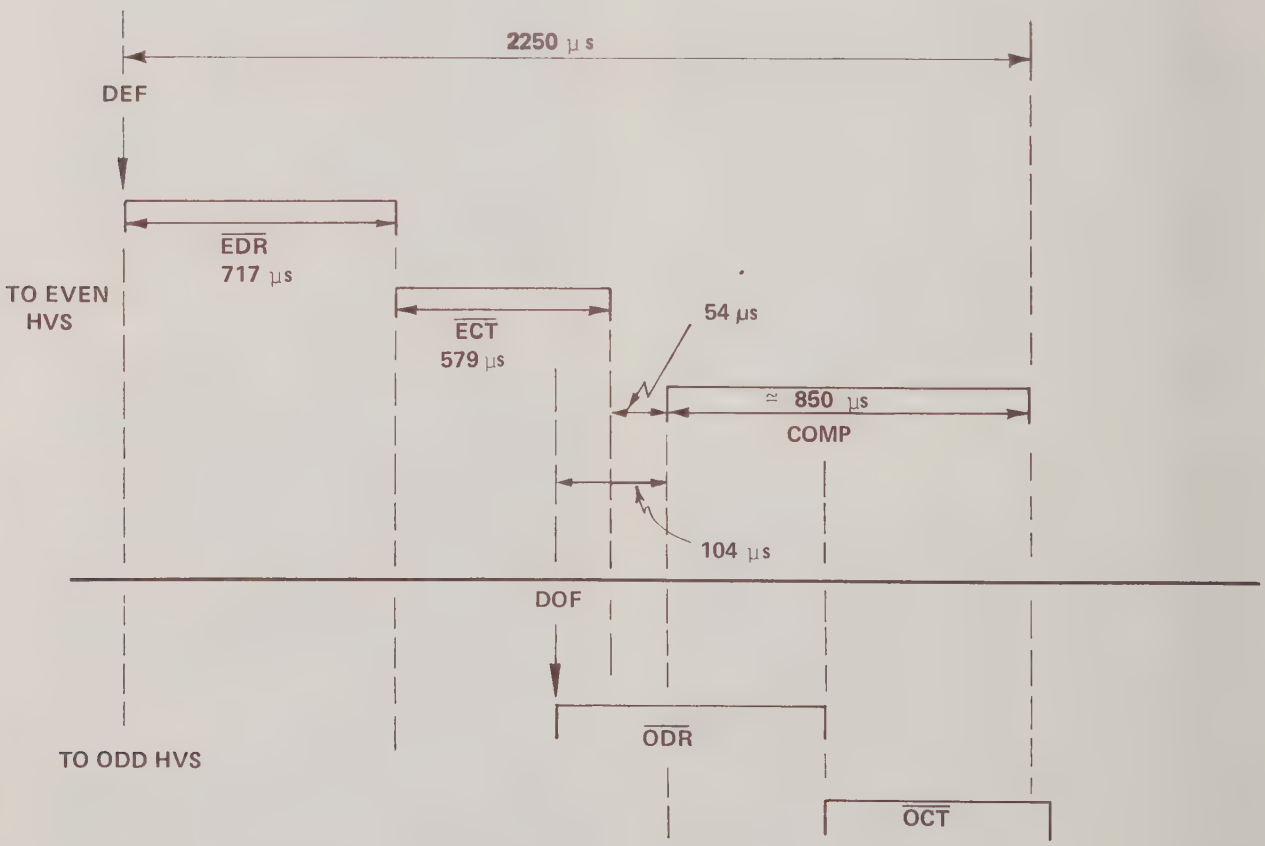
board as EF and OF. These signals will be sent to the PHOTOCELL DIFF network. This circuit will output the DEF and the DOF pulses at the proper time. The DF pulse will be sent for each DEF and DOF pulse. The FR signal will be sent when EF and OF occur simultaneously (light blocked from both photocells caused by passing of the reference finger).

Low Speed Detect Circuit

The DEF and DOF pulses will be sent to the LOW SPEED DETECT circuit, the EVEN COUNTER, and the ODD COUNTER. The DEF pulse will enable the even counter to start counting. It will stop counting and reset when DOF arrives. If the count in the even counter reaches 288, the signal $\overline{\text{LOSP}}$ will be sent from the LOW SPEED DETECT circuit. This represents a time of 288 x 8.75 µs = 2520 µs, indicating an approximate decrease in print belt speed of 12%. The ODD COUNTER will function in the same manner. The $\overline{\text{LOSP}}$ signal will be sent to the ALARM LOGIC.

Drive and Commutate Signals

The EVEN COUNTER and ODD COUNTER will output 3 signals each. The EVEN COUNTER will send the $\overline{\text{EDR}}$ signal (even drive) and the $\overline{\text{ECT}}$ signal (even commutate). These signals will be sent to the EVEN HVS to develop the high voltage drive pulse to the even hammerbank solenoids. The EVEN COUNTER will also send the $\overline{\text{COMP}}$ signal during the time that the fingers travel from odd print positions to even print positions. The ODD COUNTER will do the same. The $\overline{\text{COMP}}$ signal will vary in time duration with small fluctuations in printbelt speed. The drive



and commutate signals are of fixed pulse duration. If the print belt slows down, it will take more time before the $\overline{EDR}$ or $\overline{ODR}$ signals will be sent. The total time to ground up to 30 even or odd solenoids, drive the hammers and turn off the HVS switches is 2250 us. It is during $\overline{COMP}$ time that coils are being grounded. Drive time causes hard copy printing and commutate time turns off all hammer solenoids previously turned on.

Hit Limit Counter

For each coil being grounded, an FH pulse is sent from the FOH-FEH GEN circuit. This pulse when sensed at the HIT LIMIT 30 COUNTER will cause the counter to increment upwards one count. The DF signal will reset the counter. If the count ever reaches the maximum of 30 or 8 (depending upon Printer model), the output signal HLIM will be sent to the FIRE CKT to inhibit the generation of any more FIRE signals until the counter resets on the next DF pulse. This process will assure that no more than 30 or 8 (depending upon Printer model) hammer solenoids will be driven simultaneously. This will prevent drawing more than the rated current from the +109V power supply.

If the +109V power supply drops significantly below its rated voltage, the signal HVL from the PSR board will cause HLIM to be sent prohibiting hammer solenoids from being grounded. The same process will hold true if COMP is false, ML (from the MOTOR CONTROL LOGIC) is false or if the Printer is feeding paper (FDG is true). Straps J3 and J2 are factory straps which are used to set the maximum count for the HIT LIMIT 30 COUNTER.

Rate Limit Counter

The RATE LIMIT ÷ 64 DOWN COUNT circuit is activated by placing a strap on the LMB board. This will cause the signal RTCL to release the DOWN COUNT OUTPUT. For every sixty-four T32 timing pulses, the DOWN COUNT will pulse once. With nothing being printed the UP/DOWN COUNTER 896 will be at zero. As printing starts to occur, FH pulses will count the UP/DOWN COUNTER upwards. For some printing formats, it is possible to print at a printing speed which is in excess of the rated print speed of the Printer. The UP/DOWN COUNTER 896 will average the counts (up and down) over 5 to 10 print lines. If the counter reaches the number 896, the signal GTD (governing time delay) will be sent to the NULL DETECT circuit. This will cause a delay in sending PC even though the ONE LINE MEMORY is empty. The effect is to limit the average rate to:

510 CPS for model 340
400 CPS for model 330
255 CPS for model 320
200 CPS for model 310

MOTOR CONTROL AND ALARM LOGIC (FIGURE 4-14b)

When the MOTOR ON pushbutton is pressed on the control panel or when the INT responds to a "motor-on" command from the data source, the signal $\overline{MONX}$ will cause the signal MTD to be generated from the MOTOR CONTROL LOGIC. This will reset the ALARM LOGIC. The momentary MTD pulse will also cause the signals $\overline{MTRL}$, $\overline{MTRR}$, $\overline{MTR}$ and ML to be generated. The $\overline{MTRL}$ signal will be sent to the control panel to light the MOTOR-ON LED. The $\overline{MTRR}$ signal will cause the motor relay to energize on XPS and the motor will start. The $\overline{MTR}$ signal will be sent to the INT board.

Motor Control

When the MOTOR OFF pushbutton is pressed on the control panel, or when INT responds to a "motor off" command from the data source, the signal $\overline{MOFX}$ will reset the $\overline{MTR}$, $\overline{MTRL}$, and $\overline{MTRR}$ signals. The motor will turn off and the MOTOR ON LED on the control panel will turn off. The MOTOR CONTROL LOGIC will also reset if the $\overline{ALRM}$ signal is sent. The ML output will be sent to the HIT LIMIT 30 COUNTER when MTD is true (motor just starting) or when the motor is off ($\overline{MTR}$ is true) or when the $\overline{ALRM}$ signal is true.

Alarm Logic

When the $\overline{FLTX}$ signal ($\overline{FLTX}$ = LOW PAPER or +109 VDC is crowbarred) arrives at the ALARM LOGIC, the signals $\overline{ALRM}$ and $\overline{ALML}$ are sent to INT and the control panel respectively. This will cause the INT board to indicate the alarm status to the data source and the control panel to indicate the condition to the operator by lighting the ALARM LED. When any of the PSR low voltages are below their rated value, LV will come true truning on the $\overline{ALRM}$ and $\overline{ALML}$ outputs. The $\overline{ALRM}$ signal will also be sent to the MOTOR CONTROL LOGIC.

When a slow speed on the print belt is detected, the $\overline{LOSP}$ signal will also cause the ALARM LOGIC to set. Finally, when CLP comes true after $\overline{LFS}$ has turned off at the CLP GEN (figure 4-14a), and the $\overline{LFG}$ signal has not turned off, an ALARM output will result.

PRINTER MAIN TIMING (FIGURE 4-14b)

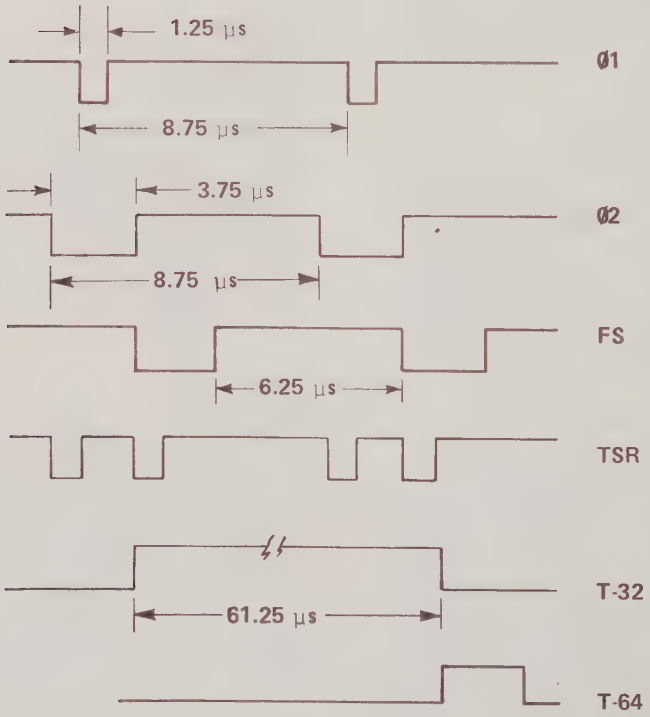
The Printer timing signals are derived initially from a 3.2 Mhz crystal clock oscillator which divides the frequency by 4 (800Kc) and then develops the phase 1 and phase 2 clock frequencies. The phase 1 and phase 2 clocks will go to all LOG board LSI chips. The two clock outputs are fused (F1 and F2). If either fuse opens, a fault circuit will be triggered. This will cause a board mounted LED to illuminate. The oscillator will also send out the FS (fire strobe) signal at phase 2 time. Finally, X TIME pulses from the phase 1, phase 2 x-timer will be sent to the TSR GENERATOR.

TSR Generator

The TSR GENERATOR circuit will output double pulses continuously in the print cycle. It will output single pulses for each character in the load cycle. The INXO input will cause TSR to double pulse in the print cycle such that odd-stored characters will be at the COMPARE circuit at odd compare time and even-stored characters will be at the COMPARE circuit at even compare time.

T-Time Clock

Finally, the T-TIME CLOCK will output a series of T-timing pulses most important of which are T32 and T64. All timing signals shown are illustrated below.



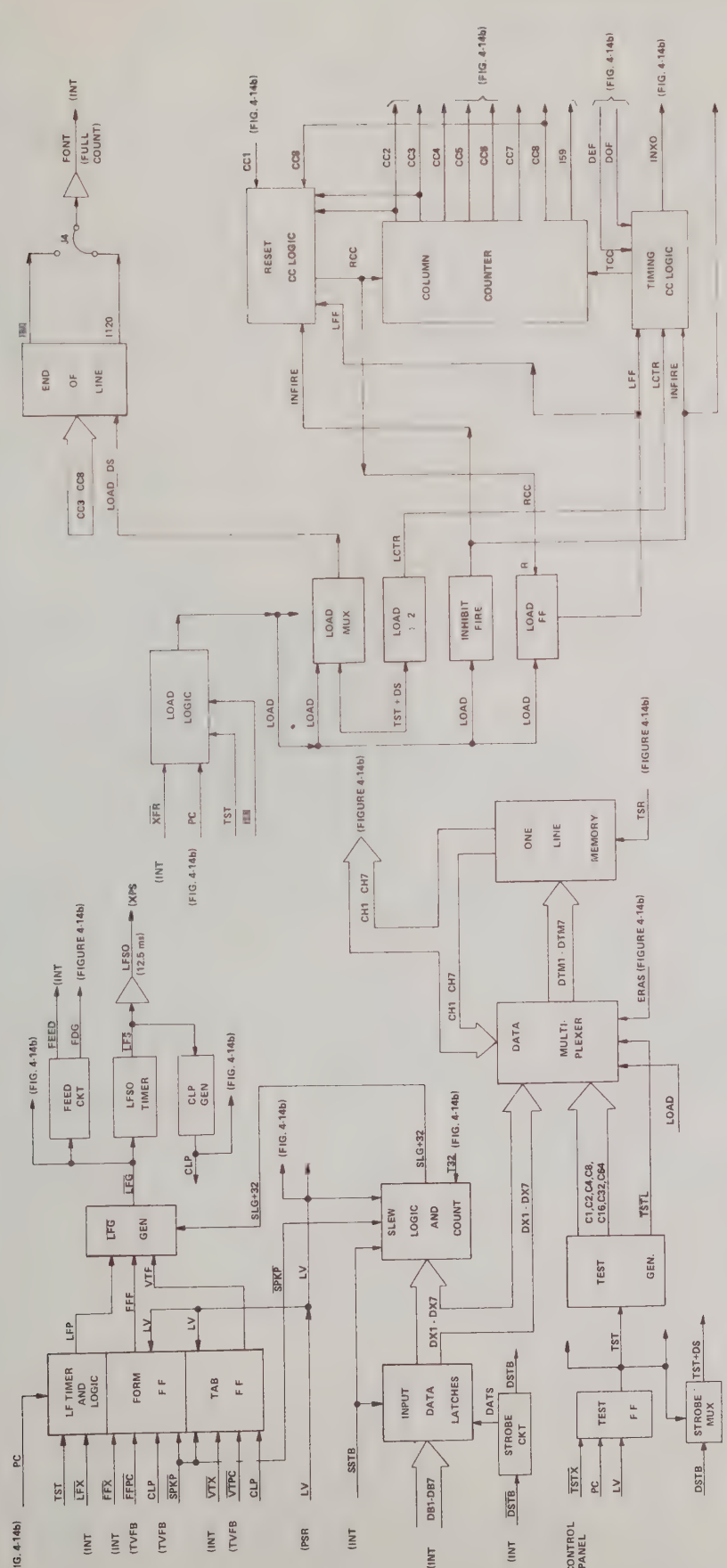


Figure 4-14a. Logic Board (LOG)

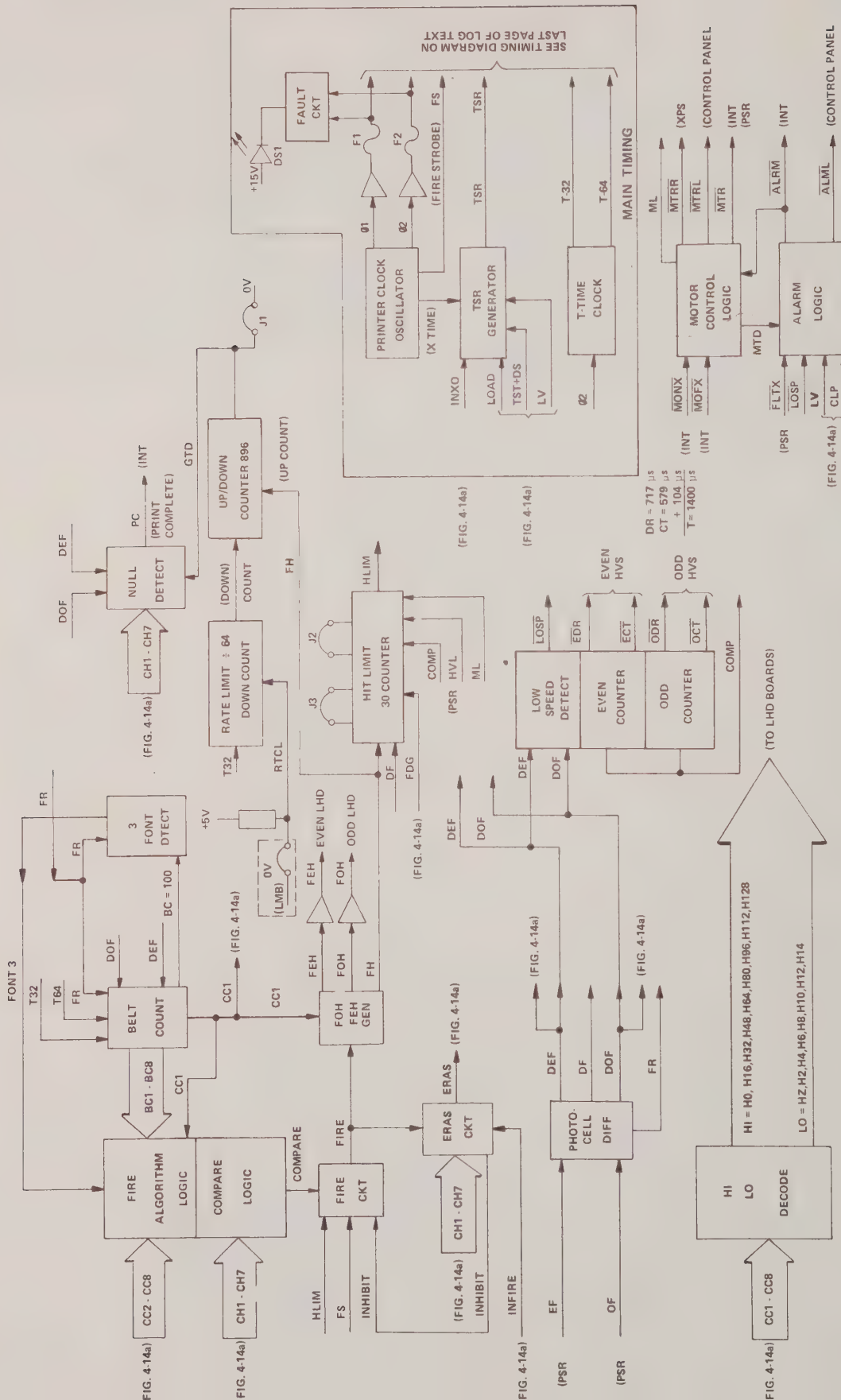


Figure 4-14b. Logic Board (LOG)

POWER CONTROL BOARD (XPS) 44B418210

FUNCTION

The XPS board receives power from the 117V AC power source and, through the power transformer located on the main frame, supplies low voltage, unregulated power to the Printer. In addition, the XPS board contains all power supply fuses, the AC line filter, motor circuit, and linefeed solenoid driver.

FUSES

F1 - 4A MDA - 157V Supply
F2 - 5A MDX - 10V Supply
F3 - 2A MDX - +25V Supply
F4 - 2A MDX - -25V Supply
F5 - 7A MDX - Input Power

CAUTION

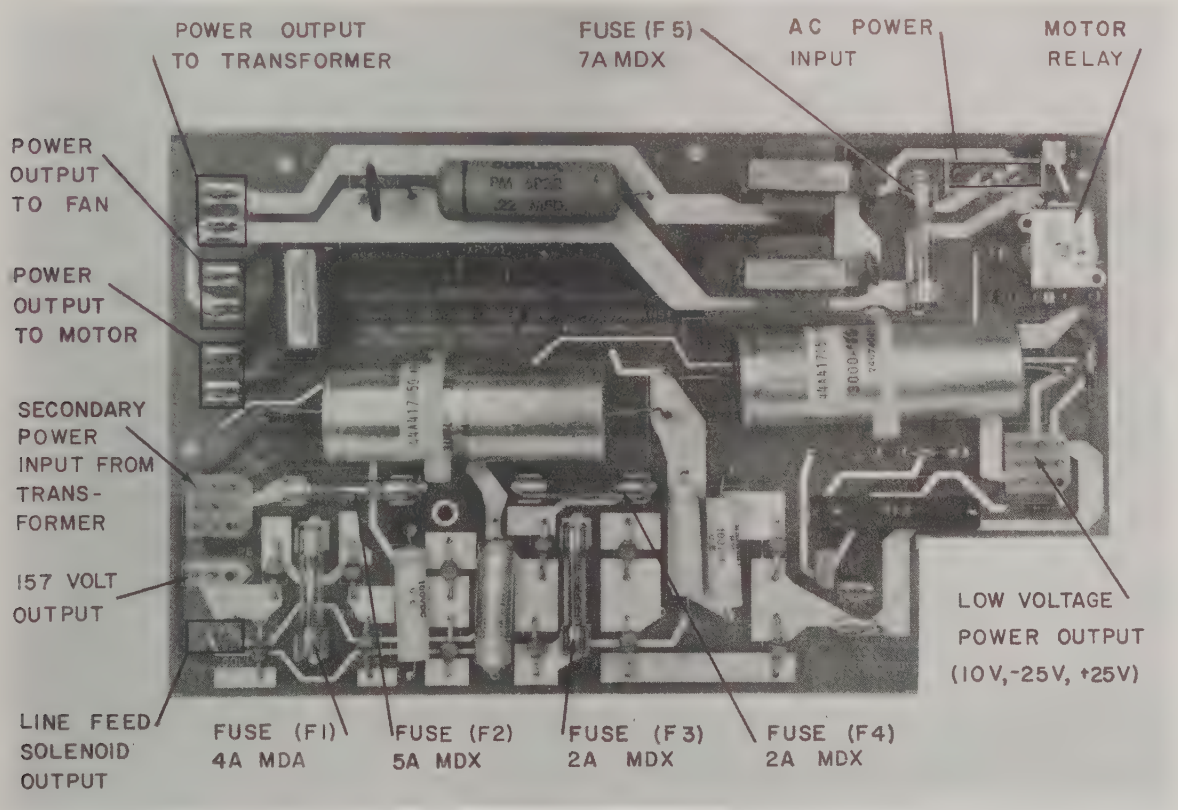
For optimum protection against short time heavy overloads, F5 must be the type of 7A MDX fuse having a single, heavy strap to the element instead of two small wires.

STRAPS - None

TEST POINTS AND WAVEFORMS - None

PRINCIPLES OF OPERATION

Power enters the Printer via the power cord and goes through the cover interlock switch and power switch located on the right rear of the Printer. Both of these switches must be closed before power exists on the XPS board.



PLL-5062

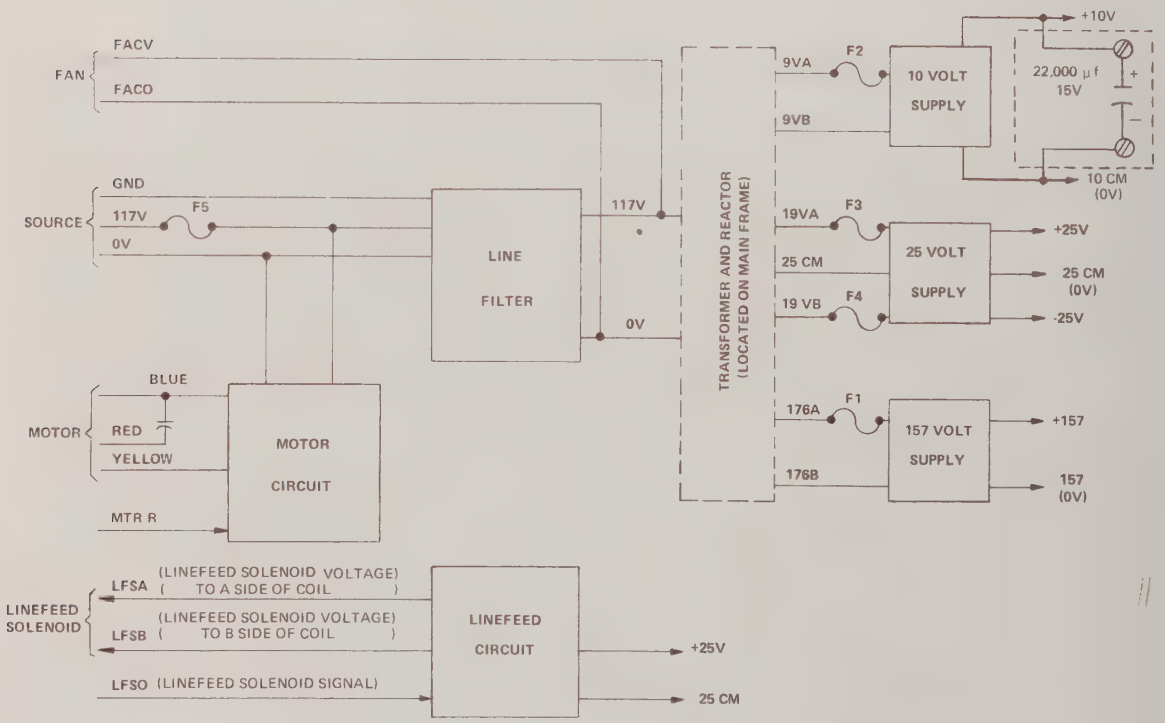
Figure 4-15. Power Control Board (XPS)

Once the incoming power exists at the AC power input on the board, it will pass through the line filter which prevents line generated RFI from entering the power supplies. The line filter also prevents unit-generated RFI from conducting back into the AC line. The fuse F5 protects the 117V AC primary circuit.

The XPS board also contains the motor circuits. The Printer motor is fed from the line side of the RFI filter. The motor circuit includes the motor relay and associated circuitry to reduce voltage transients generated by the relay contacts. Thermal overload protection is internal to the motor.

The 157 volt power supply provides power to the +109 volt regulator found on the Power Supply Regulator board (PSR). Fuse F1 provides protection against failure of the +109 volt regulator.

The low voltage power supplies provide unregulated low voltage power to the low voltage regulators on the PSR board. The +25 volt, -25 volt, and 10 volt unregulated power supplies the +15 volt, -15 volt, and +5 volt regulators respectively. In addition, -25 volt unregulated power is also used to supply the -12 volt regulator.



PLL-5063

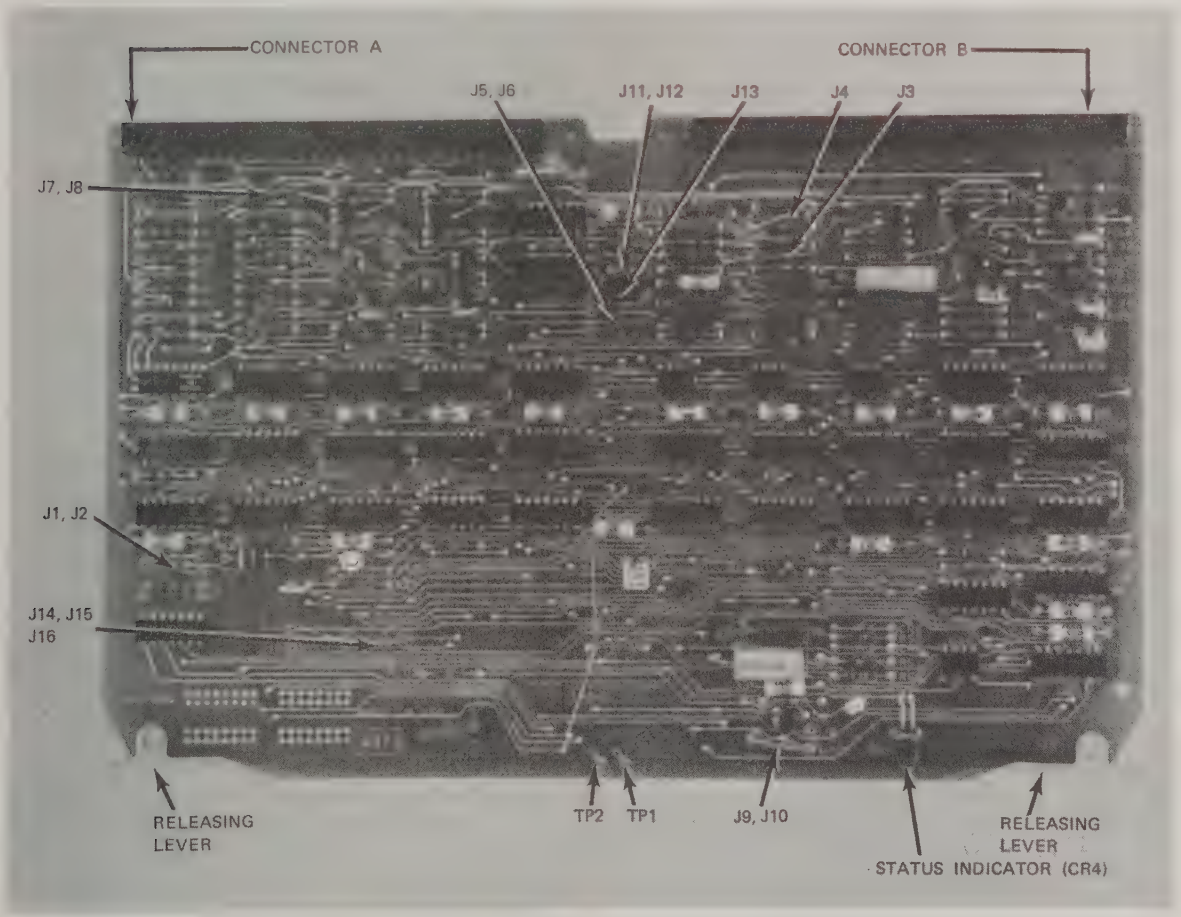
Figure 4-16. Power Control Board (XPS)

INTERFACE BOARD (INT/2)
44C417522

FUNCTION

The Interface board (INT) used in the TermiNet Line Printer interfaces the Printer with the data source (central computer system, communications buffer, or other intelligent data system device). Because of this, INT boards will differ depending upon the specific hardware or software requirements of the system in which the Printer is employed. For specific information on a particular system interface, refer to the separate INT board documentation for that system. However, there are many functions which will be identical and common to all INT boards. Therefore, the following information is intended only to describe the INT/2 board.

The INT/2 board receives all data and control signals through a 25 pin connector. It contains logic to perform a parity check. The board also contains decode circuitry to execute paper control commands, i.e., line feed, vertical tabulation, form feed, or slew. Finally, the INT/2 board contains interface logic for other control commands and status signals such as bell and low paper.



PLH-6120

Figure 4-17. Interface Board (INT)

FUSES

None

STRAPS

J1 In, J2 Out	Check for Even Parity.
J1 Out, J2 In	Check for Odd Parity.
*J1 Out, J2 Out	Do not check for Parity
J3 In, J4 Out	M+F signal high for paper motion.
*J3 Out, J4 In	M+F signal high for Motor On.
J5 In, J6 Out	No response to Form Feed, Vertical Tab, or Vertical Slew commands.
*J5 Out, J6 In	Normal Response to Vertical Format Codes.
J7 In, J8 Out	Input Data Strobe is positive going
*J7 Out, J8 In	Input Data Strobe is negative going
J9 In, J10 Out	READY is high when Printer cannot receive data.
*J9 Out, J10 In	READY is low when Printer cannot receive data.
*J11 In, J12 Out	Delete Code ignored.
J11 Out, J12 In	Delete and Underline Codes ignored (used with 64 character subset option).
J13 In	No character printed when Parity Error detected.
*J13 Out	◊ printed when Parity Error detected.
J14 In, J15 Out	PER signal reset by print action.
J16 Out	VFU code parity error not responded to.
*J14 Out, J16 In, J15 Out	PER signal reset by print action. VFU code parity error does set PER signal.
J14 Out, J16 Out, J15 In	PER signal reset by next character received without a parity error.

*Standard strapping configuration.

TEST POINTS

TP1 and TP2--When shorting TP1 and TP2 together, the test generator will be activated and the motor will turn on.

PRINCIPLES OF OPERATION

In typical applications, the 25 pin data connector on the Printer will have those signals as shown in Table 4-1 below.

Table 4-1

Interface Signals

PIN NO.	SIGNAL NAME	TO PRINTER	TO DATA SOURCE
1	Frame Ground (FRAME)		X
2	Data Bit 2 (D2)	X	
3	Data Bit 3 (D3)	X	
6	Ready to Printer (RTP)	X	
7	Signal Ground (0V)		X
8	Data Bit 4 (D4)	X	
9	Interrupt (INT)		X
10	Here Is (ANS)		X
11	Data Bit 1 (D1)	X	
12	Data Bit 6 (D6)	X	
13	Character Acknowledge (ACK)		X
14	Data Bit 7 (D7)	X	
15	Fault		X
16	Data Bit 8 (D8)	X	
17	Paper In Motion (M+F)		X
18	Data Bit 5 (D5)	X	
20	Printer Ready (RFP)		X
21	Parity Error (PER)		X
22	Bell (BEL)	X	
23	Data Transfer (TRAN)	X	
24	Data Strobe (STB)	X	
25	Low Paper (LPFP)		X

Note - Pins 4, 5, and 19 not used.

The Printer will receive one full line of data at the maximum transfer rate of 60,000 characters/sec. After the full line of data has been received by the LOG board from the INT board, the LOG board will send a busy signal to the data source via the INT board. During this "busy" time, the Printer will execute any paper feeding commands received via the first character received in the line of data, print the line of data, and execute a linefeed. While the linefeed is being executed, another line of data may be entered from the data source.

The actual data will enter the data line driver on the INT board in parallel form over the eight lines $\overline{D1}$ - $\overline{D8}$. The data will be sent from the data line driver to the parity error detect circuit and the decode circuit as $\overline{D1}$ - $\overline{D8}$. Additionally, the data will go to the LOG Board, as $\overline{DB1}$ - $\overline{DB7}$.

If a character is received having a parity error, the parity generator will generate the PER signal which is used to inform the data source of the erroneous character. Depending on the strapping arrangement selected, the PER signal can be reset in any one of the following ways:

1. When print action is initiated. A parity error in the paper control code will cause the code to be ignored but will not generate a PER signal.

2. When print action is initiated. A parity error in the paper control code will cause PER to be generated.

3. When the next character is received without a parity error. This arrangement permits the data source to immediately retransmit characters received in error to create a correct printed copy.

Another strapping option will cause a parity error to either be ignored by the Printer, or to cause the data line driver to force the output lines $\overline{DB1}$ - $\overline{DB7}$ (going to LOG) to an "ON" condition. This will in turn cause the parity error symbol "◇" to be printed.

The parallel data $\overline{D1}$ - $\overline{D8}$ will be sent to the decode circuit as well as to the parity error detect circuit.

The first character in each line of data is concerned with controlling paper movement; however, if the motor is off, the first character may also be used to initiate the motor on sequence. The decode circuits are enabled for only the first character by the first character enable signal (FC). Along with each character, a strobe signal is received from the data source. A strapping option is provided to allow either a negative or a positive going data strobe. The data strobe passes through a 2μs delay circuit and fires a 5 μsec one shot. This 5 μsec signal is called DS. Assuming that the first character is a valid paper moving code, the decode circuit will output the appropriate paper movement command (LF, FF, VT, or slew) to the Printer. A strapping option is provided to disable the special VT and FF codes and the slew option which will cause the VT and FF or FF and LF code to result in a line feed only. A series of gating circuits are used so that only the appropriate decoded signal will cause the desired paper action to occur. The First Character (FC) signal is also sensed by the slew gate along with $\overline{D7}$. If D7 is a logic 1 (for the first character), the Slew Strobe (SSTB) will turn on. During First Character time, the Data Strobe to buffer (DSTB) which is used to clock data on lines $\overline{DB1}$ - $\overline{DB7}$, is inhibited. Also, DSTB will be inhibited anytime D6 and D7 are both a logic 0 (control character). This means that no control codes or paper control codes are able to enter the Printer memory. Whenever the first character is a paper slew command ($\overline{DB7}$ = logic 0), the Slew Strobe (SSTB) will be sent to the LOG board so that $\overline{DB1}$ through $\overline{DB6}$ of that character can be clocked into the slew counter. This in turn will determine how many lines (up to 63) of paper will be slewed. A strapping option is provided which causes Delete codes to be ignored. Also, when the 64 character subset option is used, a strapping option is available to cause Delete and Underline codes to be ignored.

CONTROLS

The INT board contains several control circuits to control Printer action from the data source or to inform the data source of certain Printer actions. These circuits will vary depending on which system and corresponding INT board is used. Therefore, the following control circuits discussed will be as used only on the INT/2 board.

TRANSFER (XFR) AND READY FROM PRINTER (RFP)

The Transfer signal (XFR) is derived from the TRAN signal (pin 23) which is sent to the Printer from the data source. The XFR signal, in turn, enables the Ready From Printer (RFP) signal (pin 20) provided that the alarm, low voltage, or test conditions do not exist. A strapping option is available to make RFP either high or low when the Printer cannot receive data. The RFP signal is used to inform the data source that the Printer is ready for data. The RFP signal

is used to light the READY LED indicator on the INT/2 board. The RFP signal will cause the data source to begin transferring data to the Printer. When a full line of data has been clocked into the Printer memory, the signal $\overline{FC}$ derived from Full Count (FCNT) will turn off XFR which will in turn cause RFP to turn off. This will cause the data source to go busy until the Previous line of data has been printed. After the line of data has been printed, the signal IPC which is derived from Print Complete (PC) will enable XFR and RFP which will again signal the data source to start transferring more data. When the data source has less than a full line of data to send, the data source will send the signal TRAN following the last character in the data line. This will turn off SFR and RFP causing the received data to be printed.

Motor On

The motor will automatically turn on upon receipt of data or TRAN signal from the data source, or can be turned on manually with the pushbutton switch on the control panel. Since the paper control character may be received by the Printer when the motor is off, this character may be used to initiate the motor on sequence. MON signals from the interface are ignored.

Motor Off

The motor will turn off approximately one minute after the last printing action occurs, or manually with the pushbutton switch one the control panel. MOF signals from the interface are ignored.

Bell Signal (BEL)

The Printer bell will sound upon receipt of a signal on the BEL input line (pin 22) of longer than 2 μs in duration.

For multiple bell ringing, the pulses from the data source must be at least 500 ms apart.

Ready to Printer (RTP)

When the RTP lead (pin 6) from the interface to the Printer is a logic "1", the READY indicator on the Printer control panel will light.

Interrupt (INT)

The signal INT (pin 9) will be sent to the data source when the INTERRUPT pushbutton is pressed on the Printer control panel.

Answerback (ANS)

The signal ANS (pin 10) is sent to the data source when the HERE IS pushbutton is pressed on the Printer control panel.

Low Paper (LPFP)

The signal LPFP (pin 25) is sent to the data source when the low paper switch on the Printer senses the absence of paper.

Acknowledge (ACK)

The signal ACK (pin 13) is sent to the data source after each character has been received by the Printer logic board. This signal will limit data transfer to one character every 14 to 20 μs. A maximum data transfer rate of 60,000 cps is possible when the ACK signal is not used.

Motor or Feeding (M / F)

Motor or Feeding (M / F signal (pin 17) is used to signal the data source on the status of the Printer. Depending on the strapping arrangement used on the INT/2 board, the data source can be informed through M / F lead when paper is in motion or when the motor is off.

Fault

A fault signal (pin 15) is generated and sent to the data source when an alarm condition exists, or Printer voltage is too low.

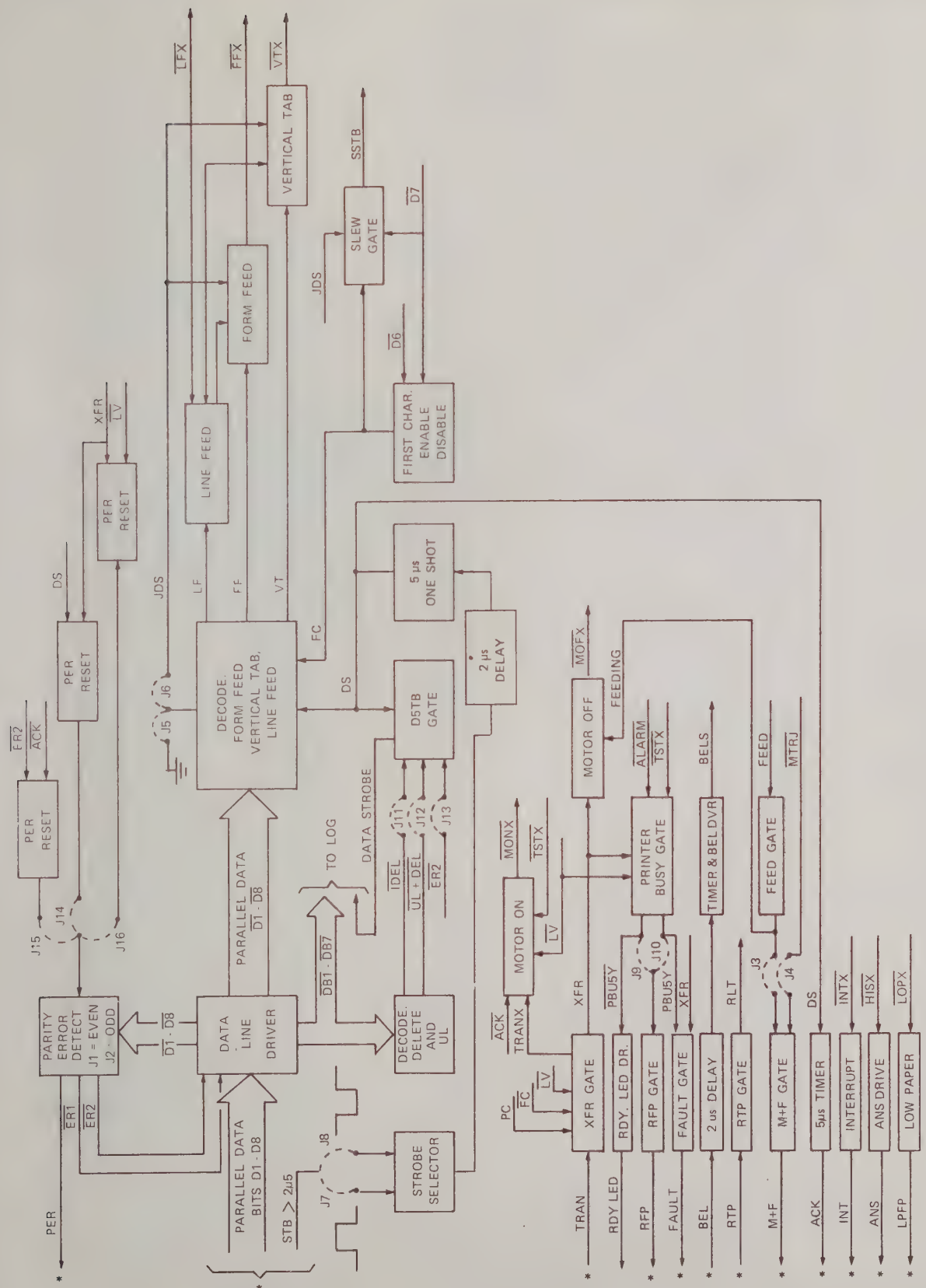


Figure 4-18. Interface Board (INT/2).

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* Denotes Interface Signal

SECTION 4

GLOSSARY

The following glossary contains a list of most of the commonly used signal names and their definitions used in the TermiNet 340 Line Printer.

ACK	Acknowledge
ALML	Complement of Alarm Light
ALRM	Complement of Alarm
ANS	Answerback
BEL	Bell
BELS	Complement of Bell Signal
CBAR	Crowbar
D1-D8	Data Lines 1 through 8
DB1-DB7	Complement of Data Bits 1 through 7
DSTB	Data Strobe
ECT	Even Commutate
EDR	Even Drive
EF	Even Finger
EHD	Even Hammer Drive
ELED	Even LED
EVNF	Even Finger
FCNT	Full Count
FCOM	Phototransistor Common
FEED	Paper Feed Signal
FEH	Fire Even Hammers
FFPC	Formfeed Photocell
FFX	Complement of Formfeed Signal
FLTX	Complement of Fault Signal
FOH	Fire Odd Hammers
FRAME GND	Frame Ground Ground (Chassis)
HISX	Complement of Here Is Signal
HVL	High Voltage Low
HZ	Column Decoding Z Line
H0	Column Decoding 0 Line
H2	Column Decoding 2 Line
H4	Column Decoding 4 Line
H6	Column Decoding 6 Line
H8	Column Decoding 8 Line
H10	Column Decoding 10 Line
H12	Column Decoding 12 Line
H14	Column Decoding 14 Line
H16	Column Decoding 16 Line
H32	Column Decoding 32 Line
H48	Column Decoding 48 Line
H64	Column Decoding 64 Line
H80	Column Decoding 80 Line
H96	Column Decoding 96 Line
H112	Column Decoding 112 Line
H128	Column Decoding 128 Line
INT	Interrupt
INTX	Complement of Interrupt P.B.
LEDC	LED Common
LFSO	Linefeed Solenoid
LFX	Complement of Linefeed P.B.
LOPX	Complement of Low Paper Switch
LPFP	Low Paper from Printer
LTP	Ready Lamp
LV	Low Voltage
LVS	Low Voltage Signal for HVS
M+F	Motor or Paper Feed
MOF	Motor Off
MOFX	Complement of Motor Off P.B.
MON	Motor On
MONX	Complement of Motor On P.B.
MTR	Complement of Motor Signal
MTRL	Complement of Motor Light
MTRR	Complement of Motor Relay
OCT	Odd Commutate
ODDF	Odd Photocell
ODR	Odd Drive
OF	Odd Finger
OHD	Odd Hammer Drive
OLED	Odd LED
OSC	Oscillator Output
PC	Photocell
PER	Parity Error
PON	Power On
RFP	Ready from Printer
RLT	Complement of Ready Light
RTP	Ready to Printer
SOL1-SOL132	Solenoid Coil Connection for Print Position 1 through 132
SPKP	Sprocket Pulse
SPR1-SPR4	Spare #1 through Spare #4
SSTB	Slew Strobe
STB	Strobe
TRAN	Transfer
TSTX	Complement of Test P.B.
VTPC	Vertical Tab Photocell
VTX	Complement of Vertical Tab P.B.
XFR	Complement of Transfer Signal
Z	Zener Diode Paralleling Connection
0V	Signal Ground

CHAPTER 5
MAINTENANCE
SECTION 1
PREVENTIVE

GENERAL

Preventive maintenance consists mainly of visual inspection, cleaning, and lubrication. If a problem is discovered and the cause is not obvious, refer to the Troubleshooting section of this Chapter. If the cause of the problem has been determined, refer to Parts Removal and Adjustment section of this Chapter to install a new component or to make an adjustment.

It is suggested that the instructions in this section be performed every six months or 1000 motor on hours whichever occurs first (unless otherwise noted). It may be necessary for the serviceman to modify Preventive Maintenance instructions to suit extreme variations of use and environment of the Printer.

VISUAL INSPECTION

Raise the cover and check the Printer as follows:

1. Inspect belts, pulleys and gears for wear. An accumulation of dust under the pulleys or line feed clutch is an indication of excessive wear of a pulley, clutch, or a drive belt.

2. Check for loose or missing parts.

3. Check for bent or broken print fingers.

4. Check for frayed or folded ribbon.

5. While holding the motor pulley stationary, move the print belt back and forth and check for excessive play (movement of the print belt more than one finger width) in the system. Too much play indicates a loose pulley or drive belt.

6. Rotate print belt and check for freedom of movement.

7. Check for loose connections and frayed wiring.

ADJUSTMENT CHECKS

Check all adjustments in Table 5-3. If adjustment is needed, refer to Section 3 of this Chapter for procedure.

OPERATION CHECKS

Perform the checkout procedure in Chapter 2.

CLEANING AND LUBRICATION

CLEANING

One of the most important areas to keep clean on the Printer is the area around the photocell. A build-up of paper dust around this area can impair the effectiveness of the photocell causing erroneous printing. The most efficient method for cleaning the photocell is to remove the ribbon cartridge and blow away the paper dust on top of the photocell block on both sides of the print belt. A small squeeze ball type air blower, which is commonly used for cleaning camera lenses, is recommended for cleaning the photocell. Photocell cleaning must be performed during each routine preventive maintenance, and additionally Operators should be advised to perform this function each time a ribbon cartridge is changed.

If necessary, the platen should be cleaned with alcohol to remove ink accumulations.

CAUTION

DO NOT APPLY ALCOHOL OR ANY OTHER CLEANING AGENT TO AN OILITE* BEARING.

Accumulations of dirt inside the Printer can be removed with a cloth dampened in alcohol or blown out with dry compressed air (if available).

Type fingers can be cleaned by using a type cleaning brush backed by a sponge or soft cloth. See Figure 5-1.

Keep the inside of the print belt clean by wiping with a dry cloth or blowing with dry compressed air (if available). Care should be exercised not to damage or deposit dirt on the rebound belt.

*Registered trademark of Chrysler Corp./Amplex Div.

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Figure 5-1. Cleaning Type Fingers

LUBRICATION

1. When cleaning parts before lubrication, do not use alcohol or any other cleaning agent on OILITE bearings.

2. Lubricate all areas of the Printer covered in Table 5-2 with SAE 10w-20w-40 motor oil and Lubriplate* #630-AAME-D6A3 grease.

BUTTON-UP

The preventive maintenance procedure should be completed by performing the following:

INSPECTION

1. Wires must not touch any moving parts.

2. Check for blown fuses on the XPS board and secure power supply cover.

3. All sub-assembly hardware must be secure, especially the following:

a. Hammer and Print Belt Assembly

b. Motor

c. Pulleys

d. Platen

e. Interlock Switch

f. Rebound Bar

g. Belt Guides

h. Photoelectric Sensor

i. Forms Tractor Assembly

4. Make sure no loose hardware or other foreign matter is inside the Printer, and that all retaining rings are in place on pulleys, shafts, etc.

5. Check platen movement to make sure it turns freely.

6. Check that the forms tractors rotate easily when the platen advance knob is rotated counterclockwise. It should not be possible to rotate them in the clockwise direction.

7. Make sure the paper handling system is adjusted so the paper feeds freely and does not skew. (See "Chapter 3 — Operation" for paper handling procedures.)

8. Check to see that the print belt rotates freely in the counterclockwise direction when moved by hand.

EXTERNAL CLEANING

Clean the top and bottom covers, pedestal, and control panel with a cloth dampened with a non-abrasive household cleaning detergent. Wipe all cleaned areas with a cloth dampened with water. Use only water and a soft, lint-free rag for cleaning the paper shield.

TOOLS AND TEST EQUIPMENT

The test equipment recommended for checking outputs on PCB test points is a Dual Trace Oscilloscope. "Scope" syncing should be done internally from observed test points.

Special tools helpful in servicing the Family of TermiNet 340 Line Printers are listed in Table 5-1a. A listing of suggested standard tools for servicing these Line Printers appears in Table 5-1b.

*Registered trademark of Fiske Brothers Refining Company

Table 5-1a

Special Tools

PART NUMBER	ITEM	PURPOSE
44A410619-G01	Timing Gauge	To set correct timing of hammer fire for correct print out.
44A410588-G01	Bearing Puller Tool	Removal of jackshaft bearings.
44A410583-001	Pulley Height Gauge	Setting correct vertical height of shimmed print belt pulleys (to match belt guides).
44B412269-001	Finger Removal Pliers	For extracting and replacing print belt print fingers without damaging type head.
44A417371-001	Lubricant	Lubricating the print belt.
44A410695-G01	Graphite Solution	Replacing worn graphite coating on print belt.
	Connector Removal Tool	Separating hammerbank connectors.
44A418630-003	Manual Tape Punch and Splicer	

Table 5-1b

Suggested Standard Tools

(1/8 in. x 8 in.) Flat Blade Screwdriver	(Xcelite R188)
(5/32 in. x 4 in.) Flat Blade Screwdriver	(Xcelite R5324)
*(3/16 in. x 8 in.) Flat Blade Screwdriver	(Xcelite R3164)
(1/4 in. x 6 in.) Flat Blade Screwdriver	(Xcelite R146)
(5/16 in. x 8 in.) Flat Blade Screwdriver	(Xcelite R5168)
*Stubby Flat Blade (1/4 in. x 1 in.) Screwdriver	(Xcelite S141)
*Flat Blade Offset Screwdriver (#6, #10)	(VACO VO-2)
*Screw Launcher (3/16 in. x 6 in.)	(VACO K-36)
*6 in. Adjustable Wrench (3/4 in. Jaws)	(Diamalloy D76)
*1/4 in. Regular Nut Driver	(Xcelite HS8)
7/16 in. Regular Nut Driver	(Xcelite HS14)
Extra Long Magnetic Nut Driver (1/4 in. x 10 in.)	(Xcelite A8M)
5/16 in. Combination Wrench	
.050 in. Across Flat Hex Key	
1/16 in. Across Flat Hex Key	
5/64 in. Across Flat Hex Key	
9/64 in. Across Flat Hex Key	
5/32 in. Across Flat Hex Key	
*Drift pin (1/16 in. Dia.)	
*Needle Nose Pliers	(Xcelite 56CG)
Diagonal Pliers	(Xcelite 55CG)
Long Nose Pliers	(Xcelite 41CG)
Knife	(X-ACTO #2)
*Replacement Knife Blades	(X-ACTO #25)
Feeler Gauges (0.0015 in. to 0.025 in.)	(K-D Tools, Lancaster, Pa. K-D No. 161)
*8 oz. Belt Tension Gauge	(Teletype #110443)
15 Watt Soldering Iron	(Ungar Princess #6903)
*15 Watt Soldering Element	(Ungar #6915)
*Soldering Tip	(Ungar #6961)
*Soldering Aid	(Hunter #51)
Desoldering Tool	(Soldapullt D5017)
60/40 Resin Core Solder	
*Heat Sink	(Hunter No. 51G)
*Tip Cleaning Sponge and Stand for Holding Iron	
Wire Strippers (#30 AWG – #12 AWG)	
Utility Push-Pull Gauge	(Chatillon Catalog No. LP15. John Chatillon & Sons, 83-30 Kew Gardens Road, New Gardens, New York 11415)
Blower – Photocell Cleaning	(ACCURA, Super Jet Blower Brush, Code No. 02533, R-H Div. of Interphoto Corp., New York, N. Y.)

*Optional

Table 5-2

LUBRICATION

LUBRICATION POINT	METHOD
Left Idler Pulleys	- Remove belt and pulleys. - Wipe bearing clean with clean cloth. - Wipe bearing shaft clean and apply two drops of oil. - Reinstall pulleys.
Left Jack Shaft Bearing	- Apply two drops between pulley and side frame.
Right Jack Shaft Bearing	- Apply two drops of oil on shaft adjacent to end of bearing on inside of machine.
Line Feed Clutch	- Apply two drops between the "E" ring and clutch housing.
Platen Drive Gears	- Remove all gears. - Remove any dried grease and dirt from gears. - Apply two drops of oil to each gear post. - Lightly coat gear teeth with grease. - Replace gears.
Platen Bearings	- Remove platen. - Apply two drops of oil adjacent to each bearing. - Replace platen.
Forms Tractor Drive Gear	- Remove any dried grease and dirt from gear. - Lightly coat gear teeth with grease.
Ribbon Drive Mechanisms	- Remove ribbon drive mechanism. - Remove three reduction gears and clutch. - Remove any dried grease and dirt from gears. - Apply two drops of oil to each gear post and ribbon drive shaft bearing. - Lightly gear teeth with grease. - Replace gears and ribbon drive mechanism.
Friction Brake	- Apply one drop of oil to each end of hub.

Recommended Lubricants:

Oil . . . . SAE 10w-20w-40 motor oil.
Grease . Lubriplate #630-AAME-D6A3.

Table 5-3

ADJUSTMENTS

PART	ADJUSTMENT LOCATION	SPECIFICATION	PAGE LOCATION OF PROCEDURE
Left and Right Drive Belts	Deflection of belt with 4 oz. (114 g) of applied pressure applied to mid-span of belt.	0.10-0.30 in. (2.5-7.6 mm) – Left. 0.10-0.175 in. (2.5-4.4 mm) –Right.	5-34 5-43
Jackshaft	End play - left side.	0.003-0.008 in. (0.08-0.20 mm).	5-43
Jackshaft	Right end of jackshaft to outside surface of pulley.	Flush to 0.06 in. (1.5 mm).	5-43
Line Feed Solenoid	Between Solenoid Arm and highest Clutch lobe. (Highest point on lobe, and arm in energized position).	0.005-0.010 in. (0.13-0.25 mm).	5-45
*Rebound Bar	Between crowned outside edge of print belt pulleys and rear surface of rebound bar – (Right pulley in normal running position.)	0.046 in. (1.17 mm).	5-37
Rear Magnetic Print Belt Guide	Between crowned outside edge of print belt pulleys and rear surface of belt guide. (Right pulley in normal running position.) Height adjustable with 0.005" shims.	0.039 ± 0.003 in. (1.0 ± 0.08 mm).	5-36
Front Print Belt Guide	Between guide and print belt.	0.050-0.070 in. (1.3-1.8 mm).	5-38
VFU Drive Belt	Deflection of belt at mid-point with 2 oz. (57 g) of applied pressure.	0.07-0.13 in. (1.8-3.3 mm).	5-27
Photoelectric Assembly	Initial setting. Position of elongated hole in photoelectric housing with respect to the vertical mounting screw.	Centered.	5-42

*REBOUND BAR ADJUSTMENT IS VERY CRITICAL.
DO NOT ADJUST UNLESS ABSOLUTELY NECESSARY.

SECTION 2
TROUBLESHOOTING

MECHANICAL

Mechanical problems in the Printer causing excessive noise or binding can be isolated to the left or the right drive train. The procedure is to slip the left drive belt off the left drive pulley, and turn the Printer on. If the noise or binding condition still exists, the problem must be one of the following:

- Motor
- Right jackshaft bearing
- Left jackshaft bearing
- Linefeed clutch
- VFU mechanism (if installed)

If the noise or binding condition goes away when the Printer is turned on, without the left drive belt in place, the problem must be one of the following:

- Left idler pulleys
- Print belt pulleys
- Print belt
- Ribbon drive

ELECTRICAL

FUSES

The following Table lists fuses used in the TermiNet 340 Line Printer Family along with their part numbers, locations, and circuits they protect.

Table 5-4

FUSES

FUSE	LOCATION	PART NUMBER	CIRCUIT
4A MDA	XPS (F1)	44A418092-002	+157V
5A MDX	XPS (F2)	K9774741-P15	+10V
2A MDX	XPS (F3)	K9774741-P22	+25V
2A MDX	XPS (F4)	K9774741-P22	-25V
7A MDX	XPS (F5)	K9774741-P26	117V
1/8A PICO	LOG (F1)	44A417087-001	PHASE 1 CLOCK
1/8A PICO	LOG (F2)	44A417087-001	PHASE 2 CLOCK
*10A MDA	Pedestal	44A418092-007	250V INPUT

*Used in optional multiple voltage power supply.

STRAPPING OPTIONS

Several straps are available to change options on the TermiNet 340 Family of Line Printers. These wire straps are not soldered, but simply plug into cups located on the associated printed circuit boards (PCB's). The functions of the wire straps are given in the following Table.

Table 5-5

TermiNet 340 PRINTED CIRCUIT BOARD (PCB) WIRE STRAPS

PCB NAME	STRAP POSITION		FUNCTION
	IN	OUT	
INT/2	J1	J2	Printer checks for even parity.
	J2	J1	Printer checks for odd parity.
		*J1, J2	No parity check.
	J3	J4	Status indication for paper feeding (M+F Signal is high).
	*J4	J3	Status indication for motor (M+F Signal is high).
	J5	J6	Form Feed, Vertical Tab, and Vertical Slew commands are ignored.
	*J6	J5	Printer responds to Vertical Format Codes.
	J7	J8	For positive-going Input Data Strobe.
	*J8	J7	For negative-going Input Data Strobe.
	J9	J10	READY is high when Printer is unable to receive data.
	*J10	J9	READY is low when Printer is unable to receive data.
	*J11	J12	Printer ignores Delete Code.
	J12	J11	Printer ignores Delete and Underline Codes (used with three font belt option using 64 character subsets).
	J13		No character will print when a Parity Error is detected.
		*J13	◊ will print when a Parity Error is detected.
	J14	J15, J16	Print action will reset PER signal. Printer will ignore Parity Errors in VFU Codes.

Continued

*Standard strapping configuration.

Table 5-5

PCB WIRE STRAPS (Continued)

PCB NAME	STRAP POSITION		FUNCTION
	IN	OUT	
INT/2 (con't)	*J16	J14, J15	Print action will reset PER signal. Parity Errors in VFU Codes will set PER signal.
	J15	J14, J16	PER Signal (once set) is reset by next character received without a Parity Error.
LOG/1, 2	J4 to 80 J4 to 120 *J4 to 132		80 Print Column operation 120 Print Column operation. 132 Print Column operation.

*Standard strapping configuration.

SELF TEST

Troubleshooting (electrical) the TermiNet 340 Family of Line Printers should begin by utilizing the self test feature built into the Printer. The self test provides for a rapid checkout of Printer action. The staggered test pattern will print continuously as long as the TEST pushbutton on the control panel is held in. If results cannot be obtained from the self test, refer to the following description of the PCB status indicators and the troubleshooting guide at the end of this section.

STATUS INDICATORS (Figure 5-2)

To facilitate troubleshooting, the Line Printer contains light emitting diode (LED) status indicators located on the outside edges of four different printed circuit boards. The status indicators can be readily viewed from the front of the Pedestal when the pedestal cover and board retainer is removed. Figure 5-2 shows the locations of the indicators along with an explanation of which conditions exist when they are illuminated.

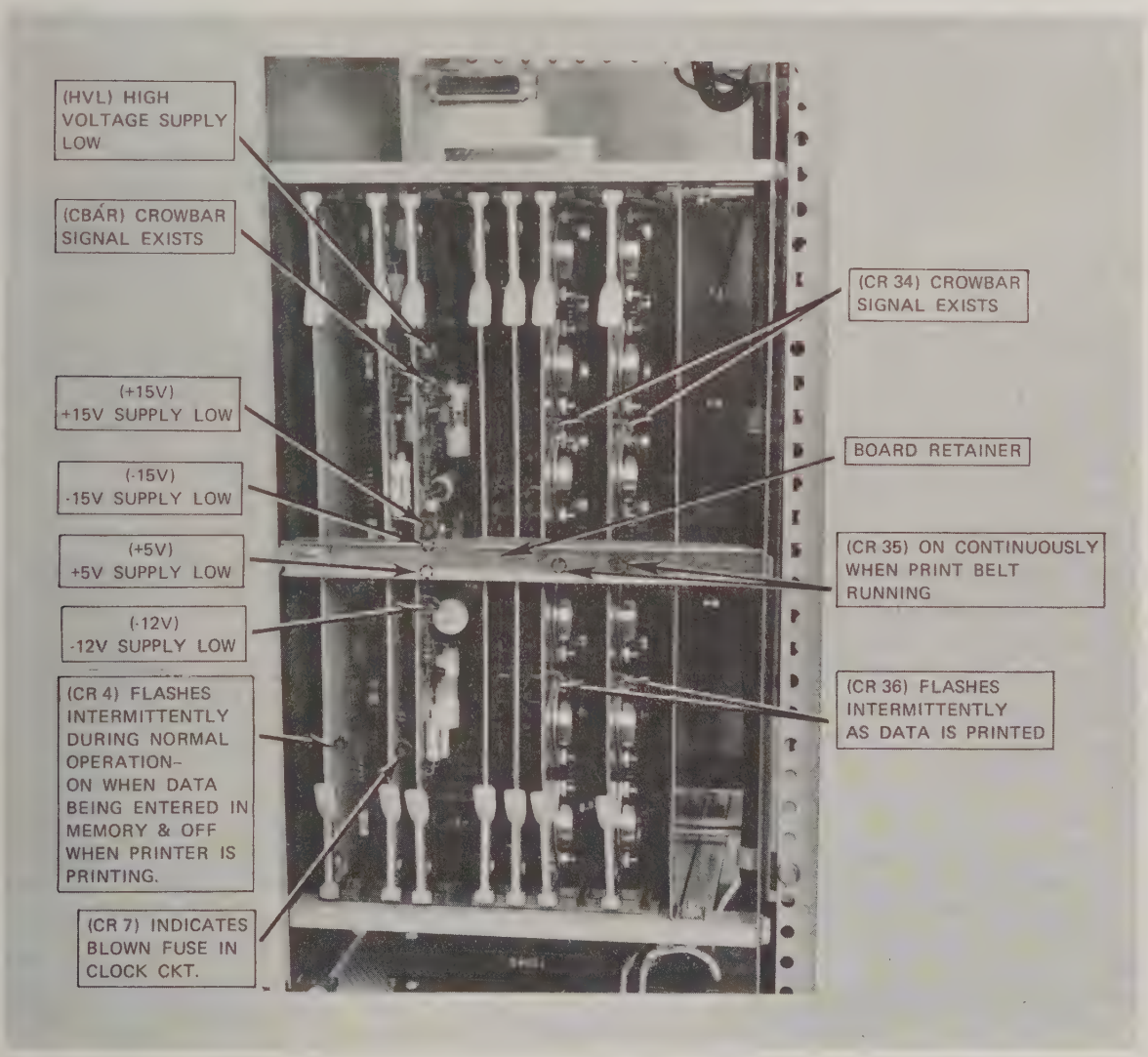
(HVL) HIGH VOLTAGE SUPPLY LOW
(CBÁR) CROWBAR SIGNAL EXISTS
(+15V) +15V SUPPLY LOW
(-15V) -15V SUPPLY LOW
(+5V) +5V SUPPLY LOW
(-12V) -12V SUPPLY LOW
(CR 4) FLASHES INTERMITTENTLY DURING NORMAL OPERATION– ON WHEN DATA BEING ENTERED IN MEMORY & OFF WHEN PRINTER IS PRINTING.
(CR 7) INDICATES BLOWN FUSE IN CLOCK CKT.
(CR 34) CROWBAR SIGNAL EXISTS
BOARD RETAINER
(CR 35) ON CONTINUOUSLY WHEN PRINT BELT RUNNING
(CR 36) FLASHES INTERMITTENTLY AS DATA IS PRINTED

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Figure 5-2. Status Indicators

USING STATUS INDICATORS TO TROUBLESHOOT HVS, LHD AND LOG BOARDS

Troubleshooting the HVS, LHD and LOG boards can be facilitated by considering the examples in the following Table.

Table 5-6

TROUBLESHOOTING HVS, LHD AND LOG BOARDS

CONDITION	CORRECTIVE ACTION
1. Print belt will not continue to run and CR34 is lit on one or both HVS PCB's and all PSR LED's are off.	a. After removing AC power, extract LHD PCB that goes with HVS which had CR34 lit. (Even LHD with even HVS; odd LHD with odd HVS.). (See Figures 5-2 and 5-5). b. Apply AC power and start motor. If motor continues to run and CR34 does not light; but CR35 does light; then, the LHD PCB is probably defective. If CR34 lights, interchange this HVS PCB with the other HVS. If the original HVS still shows defective, replace it. On the other hand, if the fault stays with the same PCB slot instead of moving with the PCB, change LOG.
2. The print belt continues to run but no printing occurs. CR35 is lit and all PSR LED's are off.	a. After removing AC power, extract and interchange HVS PCB's. b. Start Printer; if print omission has changed from even to odd (or vice versa), replace HVS PCB for columns not printing (even or odd). c. If print omission does not change, replace LOG PCB; and if that doesn't cure the problem, replace the LHD for the columns not printing.

TROUBLESHOOTING GUIDE

If a preliminary examination of the status indicators does not immediately reveal the cause of a problem, the following guide should be used as a further aid in troubleshooting the Printer.

Before using the Troubleshooting Guide, determine what the problem is and determine what functions are operating correctly. Find the problem description in the center of the guide that best describes your problem. Under the problem description, find the conditions in the left hand column of the guide that best describes the conditions related with your problem. In the right hand column, across from the appropriate condition, you will find a possible cause to your problem.

TROUBLESHOOTING GUIDE

CONDITIONS	POSSIBLE CAUSE
PRINTER WILL NOT TURN ON	
No Lamps, Motor, etc.	1. Printer not plugged into outlet. 2. Primary fuse missing or blown. 3. XPS Board.
Lamps, But No Motor Alarm Light ON	1. Paper-Out switch. 2. Paper Load Switch. 3. Low voltage (AC Input). 4. INT Board. 5. LOG Board.
Lamps, But No Motor Alarm Light Off	1. XPS Board. 2. Pushbutton switch. 3. Starting capacitor - shorted or leads off. 4. Defective motor. 5. Print fingers caught. 6. Hammer caught in fingers.
MOTOR STARTS BUT WILL NOT KEEP RUNNING	
	Electrical
2 - 3 Seconds Only	1. PSR Board. 2. Primary fuse blown. 3. Loose or broken wire to photocell. 4. HVS Board. 5. Mother Board.
	Mechanical
	1. Right or left drive belt tight. 2. Print finger missing. 3. Print finger bent or catching. 4. Misalignment of pulleys and belt guide. 5. Drive belt off. 6. Print finger not seated in belt. 7. Dust in photocell.
	Electrical Static Noise
Runs Minutes to Hours	1. Open ground lead. 2. Loose or intermittent connection.
	Electrical
	1. PSR Board. 2. Mother Board (LMB). 3. XPS Board.

Continued

CONDITIONS	POSSIBLE CAUSE
MOTOR STARTS BUT WILL NOT KEEP RUNNING (Continued)	
	Mechanical
	1. Print belt dirty. 2. Right or left drive belt tight. 3. No clearance at left jackshaft pulley. 4. Idler pulleys binding on shaft. 5. Misalignment between pulleys and belt guide. 6. Cooling fan.
MOTOR RUNS BUT NO PRINTING OR BAD PRINTING	
No Printing in Some Columns	1. Broken common wire on coil bank. 2. LOG Board (missing FOH or FEH). 3. LHD Board. 4. Broken wire on coil bank (missing one column).
A Specific Character Does Not Print or is Smudged	1. Bent print finger. 2. Top part of print finger missing.
Prints But Snags Fingers	
- On Particular Character Only	Bent print finger.
- On Particular Column Only	1. Bent clevis. 2. Plunger binding in coil bank. 3. Hammer throw adjustment.
- On Odd or Even Columns	1. LHD Board. 2. HVS Board.
- At Any Column or Character	1. Bent print finger. 2. Photocell Timing. 3. LHD Board. 4. HVS Board. 5. Dust in Photocell.
PRINTS LIGHT ON ONE PART OF CHARACTER	
Light On Top Or Bottom All Columns	1. Hammer bank not seated properly. 2. Magnetic belt guide incorrect height.
Light On Top One Character Only	Finger not seated in belt.
Light On Left	1. Hammer throw adjustment. 2. Bent clevis. 3. Plunger binding in coil bank. 4. PSR Board.

Continued

CONDITIONS	POSSIBLE CAUSE
PRINTS LIGHT ON ONE PART OF CHARACTER (Continued)	
Light On Right	1. Bent print finger. 2. Photocell Timing. 3. PSR Board.
PRINTS LIGHT ON ALL CHARACTERS	
Ribbon Does Not Move	Ribbon cartridge defective.
Ribbon Does Move	Ribbon worn - cartridge needs replacement.
PRINTS DESIRED COLUMN PLUS ADDITIONAL COLUMNS	
	1. LOG Board. 2. LHD Board.
LINE FEED PROBLEMS	
Uneven Line Feeds	1. Obstruction holding paper. 2. Friction brake. Electrical
Double Line Feed When Single Called For	LOG Board. Mechanical 1. Line feed solenoid arm too far from clutch. 2. Line feed solenoid defective. Electrical
Single Line Feed When Double Called For	LOG Board. Mechanical 1. Line feed solenoid arm too close to clutch. 2. Line feed solenoid pick-up incorrect. Mechanical
Continuous Line Feeds When Power is Applied	Line feed solenoid.
No Line Feed	1. LOG Board. 2. Mother Board.

CONDITIONS	POSSIBLE CAUSE
PAPER HANDLING	
Will Not Feed Correctly	See line feed section.
Tracks To One Side	1. Obstruction holding paper. 2. Adjustment of Forms Tractors. 3. Platen not locked at ends.
ON-LINE OPERATION	
Hammer Fires Repeatedly In Column 1	Font tab missing.
Hammer Fires Each Time Finger Passes Photocell	1. LHD Board (shorted SCR). 2. LHD Board (short on PC runs).
Random Hammer Misfire	1. XPS arc suppression defective. 2. Insufficient grounding. 3. LHD Board.
Primary Fuse Blows When Power Applied	1. XPS Board shorted. 2. Wiring shorted from XPS. 3. HVS Board. 4. LHD Board. 5. PSR Board. 6. Transformer.
Blows Primary Fuse at Particular Hammer Position	Shorted coil.
ALARM Indicator Lights	LOG Board.
Power On - ALARM Indicator Lights	LOG Board.
Motor Runs When Power Is Applied	INT Board. XPS Board.
Constant READY Light	INT Board.
Garbled Printing	1. Dust in Photocell. 2. INT Board. 3. LOG Board.

LHD PRINTED CIRCUIT BOARD (PCB) TROUBLESHOOTING

INTRODUCTION

Field service of the LHD circuit board can be carried out by authorized service personnel. Failures can be quickly recognized as occurring on the LHD circuit board or on the LOG circuit board. To quickly recognize the failure area, you must understand the individual hammer solenoid circuit operation coupled with groups of circuits functioning together. With this knowledge, a test printout can furnish an identification of the failed circuit.

NO PRINT IN ALTERNATE PRINT POSITIONS

This failure is most easily identified as either all even column print positions are blank, or all odd column print positions are blank. In either case, the alternate column positions contain a printed character.

The most logical failure is that either FOH or FEH is not being generated by the LOG PCB. Other causes could be that the signal line on the affected LHD PCB is broken after the control signal entered the B54 pin connection on the LHD PCB. The affected control signal could have become grounded to 0 volts. Any of these causes will generate the same failure identification pattern.

A secondary failure can be that the controlling HVS PCB cannot generate the required bus voltage for all even or all odd circuits.

A BLOCK OF 16 PRINT POSITIONS MISSING

The printed sheet contains printed characters in all columns except a continuous group of print positions in column 1 - 15 or 16 - 31 or 32 - 47 or 48 - 63 or 64 - 79 or 80 - 95 or 96 - 111 or 112 - 120 or 121 - 132. Since only 16 print positions do not print, the affected function can be readily identified as one of the incremented-by-16 hammer drive signals. The signal is easily identified by observing which column is missing first. As an example, if print positions 96 - 111 are missing, then the hammer drive signal, $\overline{H96}$, must be at fault.

The most logical cause of this failure is that the affected signal cannot be switched from -12 volts by the LOG PCB. Since there are no operating voltages (-15 volts) applied to the LHD PCB, it is illogical to assume that the failure occurred directly on the LHD PCB. This failure is also recognized as affecting both LHD/ODD and LHD/EVEN PCB's.

A BLOCK OF TWO PRINT POSITIONS MISSING FROM EVERY BLOCK OF SIXTEEN

The printed sheet contains printing in every print position except two in the first group of print position 1 - 15 (except position 1, which could have failed). In the fifteenth print position from last missing print, two more positions are missing, with this pattern following across the printed sheet. As an example, if print positions 2 and 3 are missing, with positions 18 and 19, 34 and 35, 50 and 51, 66 and 67, 82 and 83, 98 and 99, 114 and 115, 130 and 131, also missing, the described pattern exists. The signal common to these circuits is hammer drive signal $\overline{H2}$.

The most logical cause of this failure is that the affected signal cannot be switched from -12 volts by the LOG PCB. The affected signal in this case will be an incremented-by-2 hammer drive signal, common to each array of 16 circuits. This failure is recognized as affecting both LHD PCB's.

EXCESS PRINTING IN A BLOCK OF 16 PRINT POSITIONS

The printed sheet contains excess overprinting within only one block of 16 print positions, although all other positions print normally. As an example, positions 1 - 15 are illegible because of excessive overprinting, but positions 16 through 132 are printed normally. Since the failure affects both LHD PCB's, it can be identified as an incremented-by-16 hammer drive signal, specifically, the $\overline{H0}$ hammer drive signal.

The most logical cause of this failure is an open from the LOG PCB on an incremented-by-16 hammer drive signal line. When the other arrays of 16 print positions are being enabled by the incremented-by-2 signals, the affected array is enabled sequentially during the enabling of every other array because the incremented-by-16 line no longer holds off the gate circuits after that group has been enabled and fired.

An alternate condition similar to this failure is that every other position within a block of 16 positions overprints. This failure can be reduced to the affected LHD PCB as a possible open after the hammer drive signal was distributed to the LHD PCB. Identification of the LHD PCB can be easily identified by whether the overprint is in even columns or odd columns.

EXCESS PRINTING IN BLOCKS OF TWO EVERY FIFTEEN PRINT POSITIONS

The printed sheet contains overprinting within two print columns in every block of 16 columns, with the overprinting starting 15 print positions from the preceding overprint position. As an example, overprinting occurs in positions 1, 16 and 17, 32 and 33, 48 and 49, 64 and 65, 80 and 81, 96 and 97, 112 and 113, 128 and 129. All other positions print normally. Since the failure affects both LHD PCB's, it can be identified as an incremented-by-2 hammer drive signal, specifically, the $\overline{HZ}$ hammer drive signal.

The most logical cause of this failure is an open from the LOG PCB on an incremented-by-2 hammer drive signal line. When the other print positions within the individual block of 16 are enabled and fired, the affected two positions will also fire so long as the incremented-by-16 hammer drive signal is active. Therefore, there will be eight overprints on each overprinted position, that is, eight even and eight odd firings for the group of 16.

An alternate condition similar to this failure is that every print position within a block of 16 prints correct except one that overprints. Sixteen positions later, another overprint occurs, with this pattern repeating across the printed sheet. This failure can be reduced to the affected LHD PCB as a possible open after the hammer drive signal was distributed to the LHD PCB. Identification of the LHD PCB can easily be made by whether the overprint is in an even or an odd print column where overprinting occurs.

EXCESS PRINTING IN ONE POSITION ON THE PRINT LINE

The printed sheet contains overprinting in one print position, while all other print positions are printed correctly. This failure can be caused by either an incremented-by-16 or an incremented-by-2 open diode on an LHD PCB. When the overprinting occurs in even columns, the LHD/EVEN PCB is at fault. Overprinting in odd columns identifies the PCB as LHD/ODD.

To determine whether the fault is an incremented-by-16 diode or an incremented-by-2 diode, the data input to the Printer must be in the form of a character, then a line feed until all 132 print positions have been printed. When the overprinted position is identified as occurring once for each block of 16 characters printed, the fault is an incremented-by-16 diode. If the overprinting occurs only during the period that printing occurs within the group enabled by an incremented-by-16 command, then the fault is an incremented-by-2 diode.

Examples of these two conditions are that during the print of the first 15 characters, the overprint occurs (if not in the first 15 positions) once. As the next 16 characters are printed, again the overprint occurs in the column at fault. This pattern, when completed, identified the fault as an incremented-by-16 diode. The other print pattern that identifies the fault as an incremented-by-2 diode could be that while printing the first 15 characters, every other time a character is printed out in one column where overprinting is known to occur. All other blocks of 16 positions print correctly.

NO PRINTING IN FOURTEEN POSITIONS ON THE PRINT LINE

The print sheet contains correct printing in all columns, except 14 print positions within a group enabled by an incremented-by-16 signal. Two of the positions within that group print correctly. This identifies the failure as a shorted incremented-by-16 diode.

When the incremented-by-2 hammer drive signal at the gate wherein the incremented-by-16 diode is shorted is enabled, the -12 volt bias is removed during the period of both the even and odd period. Thus, two positions of 14 will print since the -12 volts is not coupled back onto the incremented-by-16 line during that period. During the remaining period that the affected block of 16 positions should have been enabled, the -12 volts disables the incremented-by-16 line.

NO PRINTING IN TWO POSITIONS IN EVERY GROUP OF SIXTEEN EXCEPT ONE

The print sheet contains correct printing in all positions except that within every group of 16 print positions, two print positions do not print. In one group of 16 print positions, all the print positions print correctly. This identifies the failure as a shorted incremented-by-2 diode.

As explained above for a shorted incremented-by-16 diode, printing occurs within the affected group when the source of the -12 volts bias is removed. Thus, until printout occurs within the faulted group, all groups will have two print positions biased off. Switching on the affected incremented-by-2 signal, while its corresponding incremented-by-16 signal at the affected gate is on, permits printing.

SECTION 3
PARTS REPLACEMENT AND ADJUSTMENTS

WARNING

DISCONNECT ALL POWER FROM THE PRINTER BEFORE REMOVING OR REPLAC- ANY PARTS.

INTRODUCTION

The following parts replacement, adjustment, and lubrication instructions apply equally to all models of the TermiNet 340 Line Printer family which includes the 310, 320, and 330 models. Major differences between these various models are electrical, and therefore are, confined mainly to the Logic (LOG) board. Additionally, the TermiNet 310/320/330 Line Printers do not include the front cooling fan, and contain a smaller power transformer plus fewer power supply components.

Any omission of instructions covering replacement or adjustment of particular parts or subassemblies is intentional, and should be understood to mean that those particular procedures should not be attempted in the field. For example, replacement of the rebound bar is considered to be too critical to be included as a field procedure. It then follows that clevis and plunger replacement in the Hammer and Print Belt Assembly should not be attempted in the field since this would necessitate removal of the rebound bar which is definitely not recommended.

CAUTION

THE ALIGNMENT BARS ATTACHED TO EITHER END OF THE HAMMER AND PRINT BELT ASSEMBLY PLUS THE MATING ALIGNMENT BARS ATTACHED TO THE SIDE FRAMES ARE SET AT THE FACTORY ON SPECIAL FIXTURES. THESE CANNOT BE ADJUSTED IN THE FIELD.

Instructions are also omitted for replacement of certain minor parts such as mechanical latches, hinges, linkages, etc. as replacement procedures for these parts should be obvious to the serviceman.

Also note that no instructions are included for removal of the main frame from the bottom cover. Unlike the TermiNet 300 and 1200 Printers, the TermiNet 340 Family of Line Printers are designed to permit all servicing without removal of the main frame.

In running any print tests to check the operation of the Printer, always be sure that an ink ribbon cartridge is installed.

CAUTION

OPERATING PRINTER WITHOUT AN INK CARTRIDGE INSTALLED MAY RESULT IN EXCESSIVE PRINT FINGER WEAR. FAILURE TO OBSERVE THIS CAUTION WILL VOID PRINTER WARRANTY.

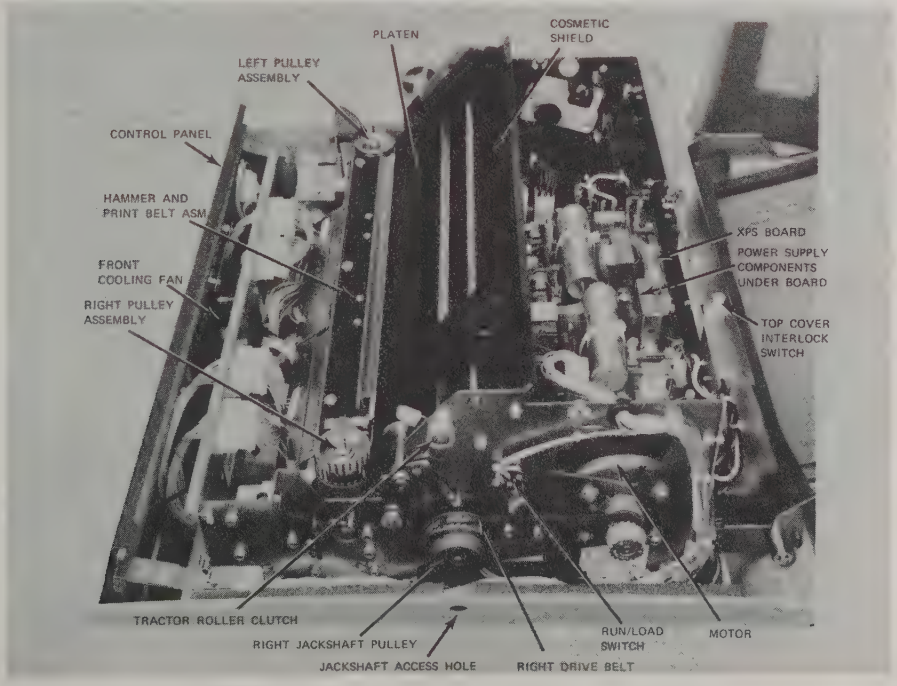

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Figure 5-3. TermiNet 340 Line Printer — Right Side

PLATEN
(Figure 5-3)

1. Open top cover and remove paper.

2. Release both platen latches on either side of main frame.

3. Carefully lift right end of platen up enough to clear right side frame.

4. Slide platen to right as far as possible.

5. Carefully lift left end of platen up until it is free.

6. When replacing platen, lower left end down so that platen gear is beside and to the right of its mating gear. Make sure plastic guard at left is on top over platen gear.

7. Lower right end of platen down until it is almost resting on right side frame.

8. Carefully slide platen to left while rotating platen slightly to mesh platen gear with mating gear.

9. Lower right end of platen down until it is seated into notch in right side frame.

10. Lock platen latches on either side of main frame.

11. Push in on platen knob, and rotate counter-clockwise to check operation.

12. Replace paper and close top cover.

POWER SUPPLY (XPS) BOARD
(Figure 5-3)

1. Disconnect Printer from AC power source.

2. Raise top cover.

3. Remove cosmetic shield.

4. Loosen the three power supply cover screws and slide cover off.

5. Remove all connectors from the XPS board.

6. Take out five hex head mounting screws and remove board.

7. Replace XPS by reversing steps 4, 5, and 6.

WARNING

DO NOT TURN POWER "ON" WITHOUT POWER SUPPLY COVER IN PLACE.

8. Turn power "On" and check Printer operation.

9. Replace cosmetic shield and lower top cover.

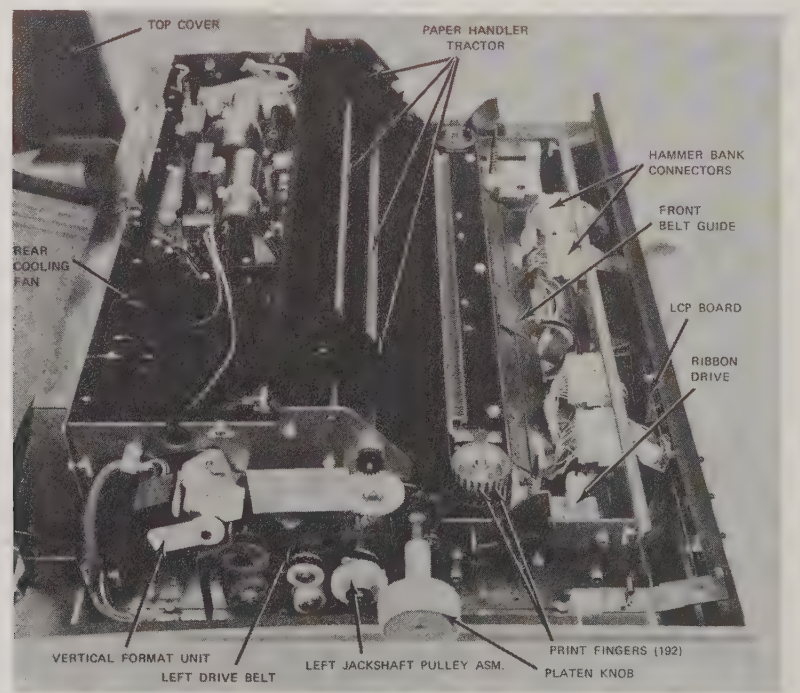

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Figure 5-4. TermiNet 340 Line Printer — Left Side

BUSTLE BOARDS
(Figure 5-5)

The main electronic circuits for the printer are packaged on seven printed circuit boards. These boards are housed in the bustle which is located inside of the Pedestal. The following procedure should be followed when replacing a bustle board.

1. Turn power "Off".

2. Remove front Pedestal cover by loosening the two captive screws at top of cover.

3. Loosen screw and release latch on board retainer. Remove retainer.

4. Remove selected board by pulling both handles at top and bottom of board.

5. When board connectors are separated from the mating pins on Mother board, the board will easily slide out of bustle.

6. Insert replacement board in proper bustle slot and push in with thumbs until board is fully seated.

7. Replace board retainer.

8. Turn power "On", and check for correct board operation.

9. Turn power "Off", and replace front Pedestal cover.

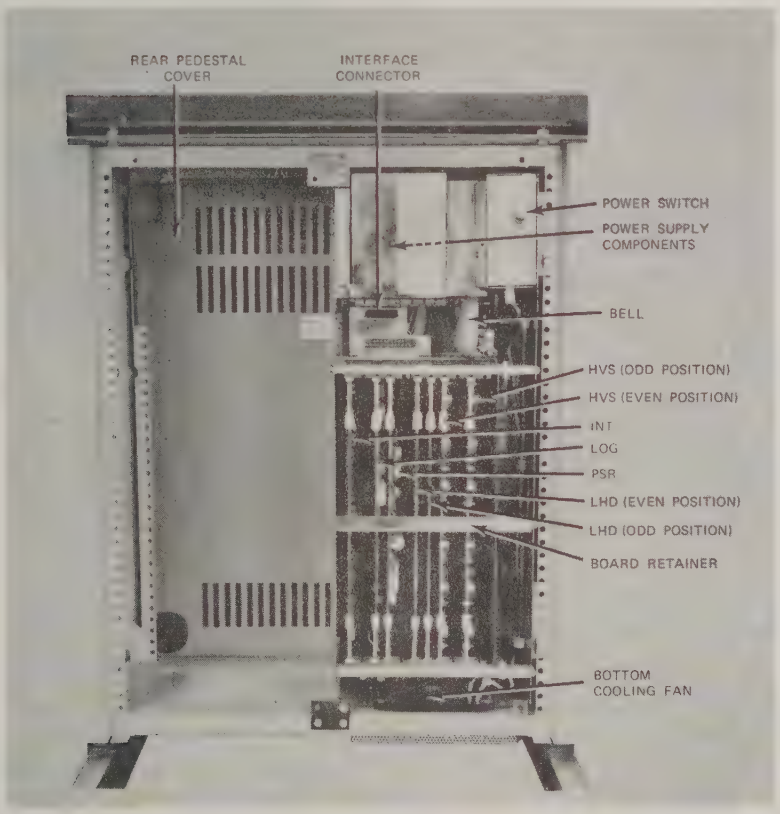

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Figure 5-5. Bustle Assembly

PRINT FINGER
(Figure 5-4)

1. Open top cover.

2. Remove ribbon cartridge.

3. Rotate print belt counterclockwise until damaged finger is just moving off the left print belt pulley toward front of Printer.

NOTE

The two or three reference fingers (corresponding to two or three font belt) with wide bottoms (Font Fingers) cannot be removed.

4. Grasp finger firmly (close to belt) with finger removal pliers and pull straight up and out of belt.

5. Grasp replacement finger as far down as possible and insert it into appropriate belt slot. Push replacement finger in approximately a quarter of an inch at a time. Take care not to bend finger.

6. Push finger down until wide flange is firmly seated against belt.

7. Check alignment on top of replacement finger in relation to other fingers in belt. If out of line, carefully bend finger to conform with other fingers.

8. Make sure all fingers are touching rebound belt.

PAPER SHIELD ASSEMBLY
(Figure 5-6)

The plastic paper shield assembly contains the spring mounted paper tear-off bar. The entire assembly is easily replaced as follows:

1. Open top cover.

2. Gently squeeze the plastic mounting arms inward to free the shield assembly from the top cover.

3. Replace paper shield assembly by reversing above steps.

PAPER RACK
(Figure 5-6)

The paper rack which attaches to the two brackets behind the paper shield can be removed by removing the screw and stud from either bracket. The paper rack can then be removed by tilting the rack enough to clear the bracket where the screw was removed, and moving it sideways to clear the other stud. To replace the paper rack, the above procedure is reversed.

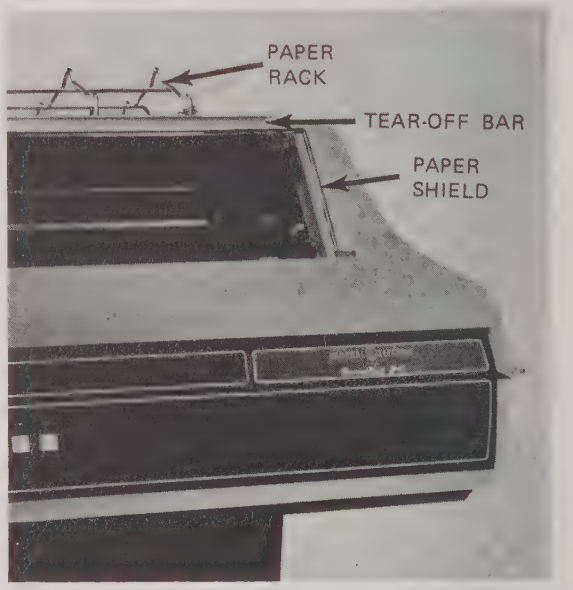

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Figure 5-6. Paper Shield and Rack

PAPER HANDLER TRACTOR
(Figures 5-4 and 5-7)

1. Open top cover.

2. Remove paper.

3. Unlock each tractor by pushing down on clamping levers.

4. Remove inside E rings from round tie rod.

5. Slide tie rod out of Printer.

6. Remove E ring from right end of tractor drive shaft.

7. Holding tractors and linefeed friction brake, slide square shaped drive shaft toward the left until it is out of printer. The two tractors and friction brake will then be free.

NOTE

The tractors can be interchanged by making a simple conversion. For example, if only a right hand spare tractor is available and the left hand tractor needs replacing, the available tractor can be easily converted to a left hand tractor. To convert a tractor, see the instructions below.

8. The roller clutch (see Figure 5-3), which engages the right end of the tractor drive shaft, can be replaced using a standard bearing puller. When removing clutch, push it out toward inside of Printer. When replacing clutch, make sure identification on clutch is facing inboard and press in place from inboard side of right main frame.

9. To replace tractors and linefeed friction brake, start square drive shaft through hole in left main frame. Then slide friction brake and left tractor onto square shaft followed by right tractor. Engage gear on left end of shaft with mating gear while sliding right end of shaft through roller clutch. Do not attach E ring to right end of shaft until later.

10. Slide round tie rod through left side frame hole, friction brake, both tractors, and hole in right side frame. Attach E ring to tie rod adjacent to side frame.

11. Slide friction brake to extreme left side of Printer and attach E ring to tie rod securing brake.

12. Position tractors in approximate operating position and visually inspect alignment of pins on tractors. If pins on left tractor are not aligned with those on right tractor, slide square shaft to left enough to disengage right tractor and rotate tractor hub ¼ of a turn. Engage right tractor with shaft and reinspect pin alignment. If alignment is still incorrect, repeat above procedure until alignment is correct. When alignment is correct, attach E ring to right end of square shaft.

13. Lubricate friction brake by placing one drop of SAE 10w-20w-40 motor oil on friction hub between end plates.

14. Install paper, adjust tractors, lock tractors in place by pushing up on clamping levers, close top cover, and check operation.

CONVERTING TRACTORS

The tractors are interchangeable. A right hand tractor can be used to replace another right hand tractor, or with a minor conversion, it can be used to replace a left hand tractor. The conversion procedure is as follows:

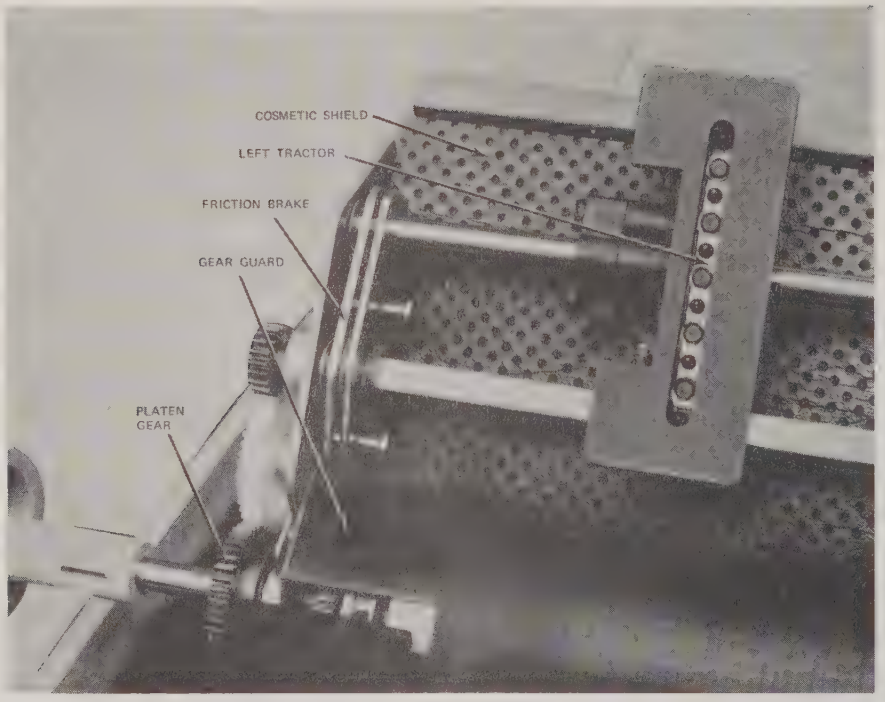
1. Position tractor on work surface as it would be in Printer.

2. Remove cover spring.

3. Press out cover pins (from inside out) and remove cover.

4. Take out Phillips Head screw holding clamp assembly and remove assembly. Rotate clamp assembly so that lever is pointing down, and secure in place with the Phillips Head screw previously removed.

5. Turn tractor over from original position and install cover with the two pins and spring previously removed.



PLH-6088

Figure 5-7. Paper Handler Tractor – Left Side

FRICTION BRAKE (Figure 5-8)

Replaceable parts on the linefeed friction brake consist of the hub and two compression springs. These parts can be replaced by removing the friction brake and disassembling it by removing the two E rings from the assembly.

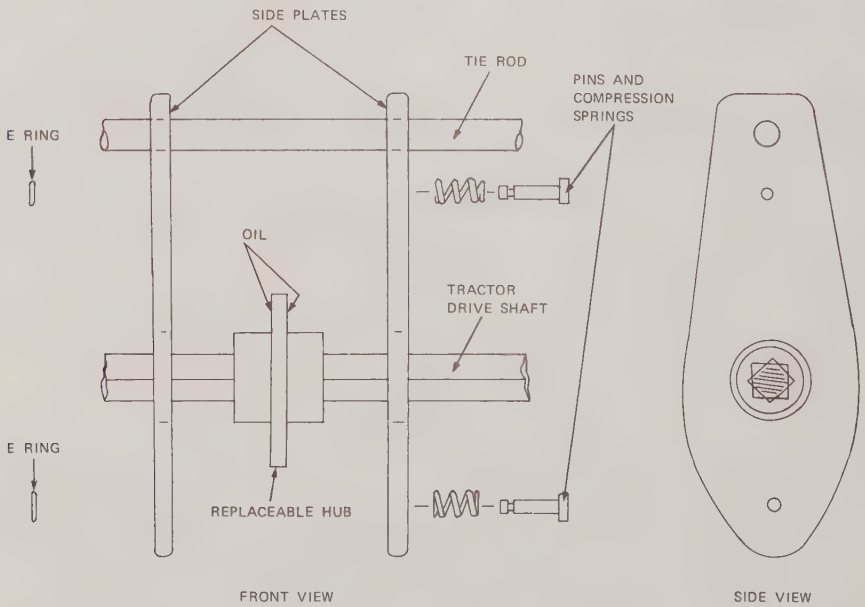


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Figure 5-8. Friction Brake Assembly.

TRACTOR DRIVE SHAFT GEAR AND BEARING (Figure 5-8)

1. Open top cover.

2. Remove paper.

3. Remove E ring from right end of square drive shaft.

4. Unlock tractors by pushing down on clamping levers.

5. Slide square drive shaft out from the left side of Printer.

6. With tractor drive shaft assembly out of Printer, place assembly in a vertical position with gear end facing up. Support bottom of gear with an open end wrench or other suitable tool. Holding tool with supported shaft assembly against a work surface, gently tap shaft extending from gear with a plastic mallet until gear has moved to end of shaft. Gear should now be loose enough so that it can be pulled off the shaft.

7. If bearing is being replaced, it can be done easily at this time as it will slide over end of shaft after gear is removed.

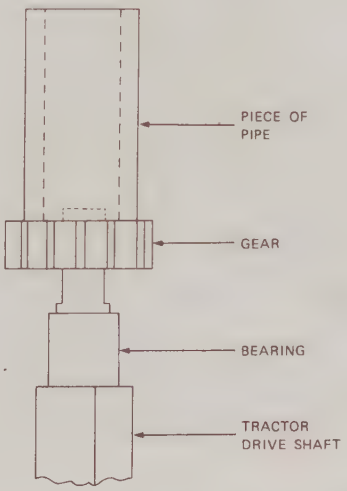
8. With bearing in place, push replacement gear on end of shaft as far as possible. Place shaft on a solid work surface in a vertical position with gear end facing up. Select a socket head nut driver or similar object such as a short piece of pipe which will slide over shaft while making contact with gear surface. Make sure tool does not have a large enough inside diameter to damage gear teeth when tool makes contact with gear. Holding shaft assembly in upright position described above, and with tool in place on gear, gently tap end of tool driving gear down onto shaft until gear is seated against shoulder on shaft. Check bearing to make sure it rotates freely on shaft.

9. Replace shaft assembly in Printer by sliding assembly in from left side of Printer. Make sure square shaft is properly engaged with hub in linefeed friction brake. Slide left and right tractors onto square shaft as shaft is placed in operating position.

10. Visually inspect alignment of pins between left and right tractors and correct alignment if necessary by slipping right tractor off shaft and rotating tractor hub ¼ turn at a time until pins are aligned.

11. Make sure tractor drive shaft gear is properly meshed with mating gear, and place E ring over right end of shaft.

12. Install paper, adjust tractors, lock tractors in place by pushing up on clamping levers, close top cover, and check operation.



PLH-6047

Figure 5-9. Tractor Drive Shaft Gear Replacement

TOGGLE ASSEMBLY (Figure 5-10)

1. Raise top cover.

2. Remove platen.

3. Remove E rings from each end of toggle assembly.

4. Slide assembly to left until right end clears sleeve in main frame.

5. Assembly is then removed by sliding it to the right until left end clears sleeve in main frame.

6. Replace toggle assembly by reversing above steps.

CAUTION

When replacing toggle assembly, sleeves must be inserted with shoulders on the outside of main frame.

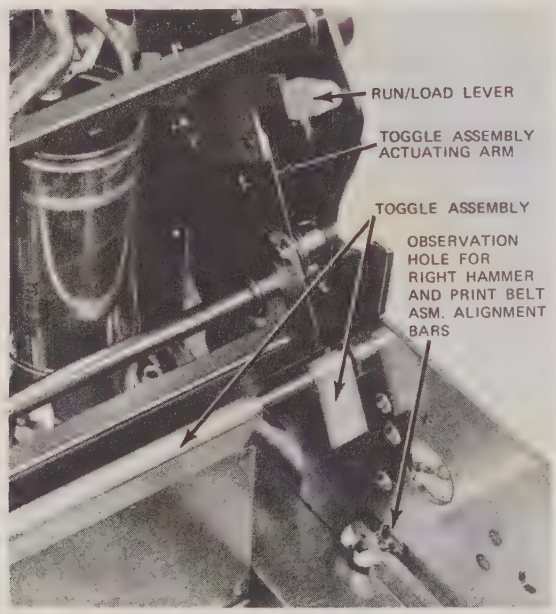

RUN/LOAD LEVER
TOGGLE ASSEMBLY ACTUATING ARM
TOGGLE ASSEMBLY
OBSERVATION HOLE FOR RIGHT HAMMER AND PRINT BELT ASM. ALIGNMENT BARS
PLH-6089

Figure 5-10. Toggle Assembly

FRONT LOW PAPER SENSOR (Figure 5-11)

1. Turn power "Off".

2. Remove plug from jack under left front corner of Printer.

3. Remove front Pedestal cover.

4. Remove screw securing horizontal bar to switch assembly.

5. Remove switch assembly from Pedestal cover.

6. Replace switch assembly by reversing steps 1 through 5 above.

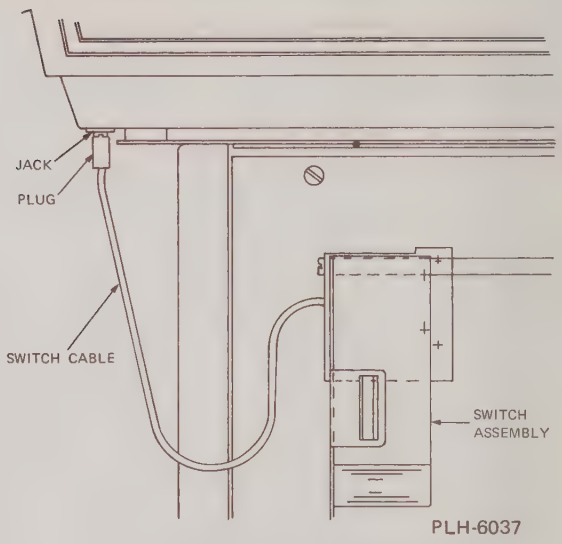


Figure 5-11. Front Low Paper Switch

REAR LOW PAPER SENSOR (Figure 5-12)

1. Turn power "Off".

2. Remove three screws attaching rear paper chute to rear of Printer.

3. Slide paper chute with attached switch to left until switch clears Printer cover through large cutout.

NOTE

If chute does not slide easily, open top cover and make sure switch wires are not caught onto frame parts.

4. When chute is out far enough to expose switch terminals, remove wires from switch, and remove chute with attached switch as an assembly.

5. Replace switch on paper chute. Switch is attached with two screws.

6. Connect wires to switch terminals.

7. Turn power "On", and check for correct operation of switch.

NOTE

If front low paper sensor is installed, remove plug from jack under right front of Printer to enable rear low paper sensor.

8. Turn power "Off" and complete installation of paper chute in Printer.

PAPER OUT SWITCH (Figure 5-12)

1. Disconnect Printer from AC power source.

2. Open top cover.

3. Remove power supply cover.

4. Remove platen.

5. Remove cosmetic shield.

6. Remove the two switch mounting screws and two attached wires.

7. Attach wires to replacement switch and secure switch to mounting bracket with screws removed in previous step.

8. Replace cosmetic shield, platen, and power supply cover.

9. Check operation of switch.

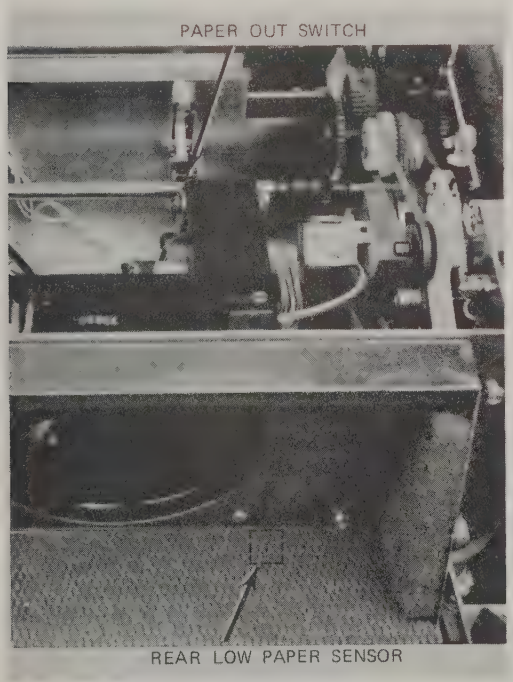


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Figure 5-12. Paper Sensors

NOTE

Switch adjustment will not normally be necessary. However, if adjustment is necessary the switch arm can be carefully bent to obtain correct contact with the paper.

TOP COVER INTERLOCK SWITCH (Figure 5-3 and 5-13)

1. Disconnect Printer from AC power source.

2. Open top cover.

3. Using a pencil, place a mark on rear frame adjacent to bottom edge of each mounting tab on switch housing.

4. Remove the two mounting screws securing switch housing to rear frame.

5. Turn switch housing around exposing switch and remove the two black and two white wires from switch terminals.

6. Squeeze the two plastic tabs together on sides of switch and pull switch up through top of switch housing.

7. Orient replacement switch with identifying marks on switch body facing out. Push switch into opening at top of switch housing until it snaps securely in place. Holding housing so that switch is exposed, connect the two white leads onto the outer two terminals at right end of switch. Connect the two black leads to the outer two terminals at left end of switch.

8. Turn switch housing around and place in position against rear main frame.

9. Insert the two mounting screws previously removed and snug screws up finger tight.

10. Adjust switch assembly by lining up bottom edges of mounting tabs with pencil marks made from step 3 above.

11. Tighten both mounting screws.

12. Connect Printer to AC power source and check operation of switch by closing and opening top cover with Printer turned "On". Printer motor should turn off when cover is raised 3/4 - 1 in. (19.1-25.4 mm). Adjust switch position if necessary. The interlock switch can be defeated (by a qualified serviceman only) while the top cover is open by pulling up on the switch plunger.

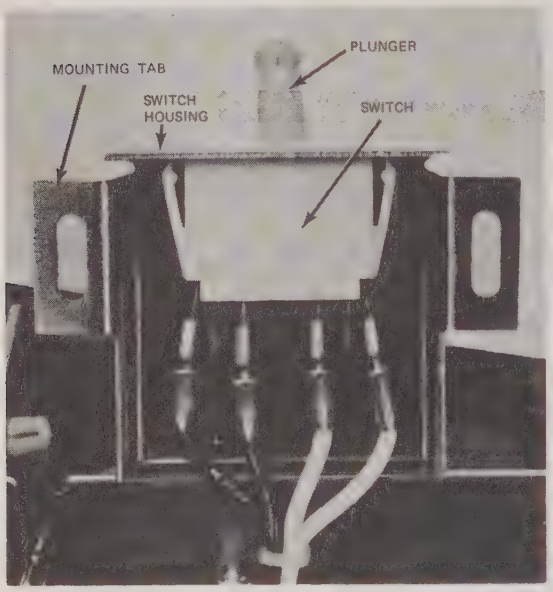

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Figure 5-13. Top Cover Interlock Switch

CONTROL PANEL AND LCP BOARD (Figure 5-14)

1. Open top cover.

2. Remove four screws and flat washers from underside of bottom Printer cover.

NOTE

Keep these screws separate from top mounting screws.

3. Remove two screws and flat washers from each end of top control panel brackets.

4. Lift up control panel and flip it over exposing the connector on the LCP board.

5. Remove two small retaining screws from connector on LCP board and remove connector.

6. Lay control panel face down on a padded work surface.

7. Remove the six LCP board mounting screws and flat washers. Lift LCP board away from control panel.

8. Replace LCP board and control panel by reversing steps 4 through 7 above.

9. Check operation.

10. Replace four bottom and four top mounting screws and washers.

11. Close top cover.

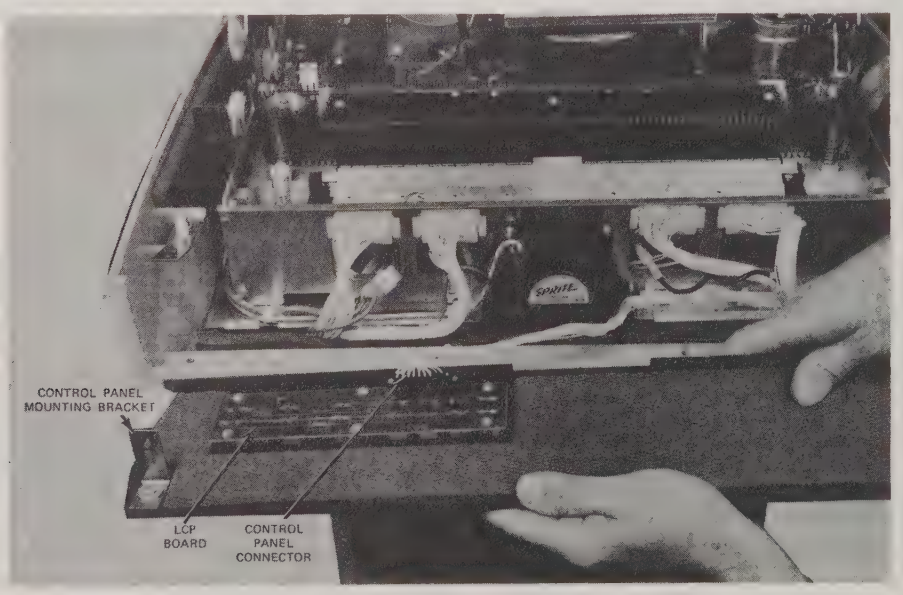

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Figure 5-14. Control Panel and LCP Board

SWITCHES AND INDICATORS (Figure 5-15)

The pushbutton switches and LED indicators on the control panel can be replaced as follows:

1. Remove control panel.

2. Remove LCP board from control panel.

3. Locate defective switch or indicator. If removing a switch, cut switch terminals under switch and remove piece of each terminal remaining in the board one at a time using a small tip soldering iron to melt solder. If replacing an LED indicator, hold soldering iron on soldered leads of LED on solder side of board until solder melts and pull LED along with LED sleeve off board.

4. When installing a replacement LED indicator, make sure removed sleeve is installed with LED. This will provide support and assure correct mounting height for the LED.

5. When installing a replacement switch, position switch so that uppermost part of switch (pushbutton cap removed) is 0.8 in. (2.0 cm) from board surface. Ends of switch terminals on solder side of board should be bent over before soldering terminals in place.

6. Mount LCP board to control panel and position panel in Printer.

7. Check operation of all control panel switches and indicators.

8. Secure control panel with the eight mounting screws previously removed.

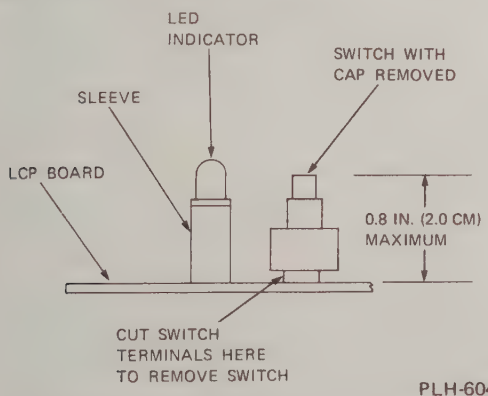

Figure 5-15. Switch and Indicator Replacement

RUN/LOAD SWITCH (Figure 5-3 and 5-16)

1. Raise top cover.

2. Place RUN/LOAD switch in the LOAD position.

3. Label the three wire leads to switch, and using a pencil tip soldering iron, remove leads from switch.

4. Remove the two switch mounting screws, retaining plate, and switch from right side frame.

5. Replace switch with the two mounting screws and retaining plate removed in step 4.

6. Solder wire leads to switch terminals.

7. Turn Printer "On" using top cover interlock switch.

8. Check RUN/LOAD switch by moving RUN/LOAD lever alternately to the RUN and LOAD positions. Printer should turn "Off" when lever is placed in the LOAD position. When lever is placed in the RUN position, it should be possible to start Printer by pressing MOTOR ON pushbutton on control panel. If switch requires adjustment, it should be adjusted by placing RUN/LOAD lever in RUN position and adjusting switch roller against protruding arm (actuator) until switch activates.

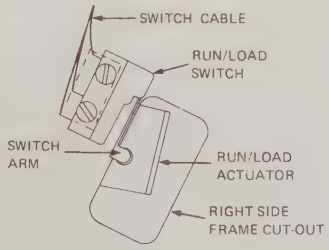

Figure 5-16. RUN/LOAD Switch Adjustment

VERTICAL FORMAT UNIT (Figures 5-4 and 5-17)

REPLACEMENT

1. Raise top cover, and remove rear pedestal cover.

2. Disconnect VFU cable from Mother Board.

3. Loosen both VFU mounting screws.

4. Rotate front of VFU down to provide enough

slack in VFU drive belt so that belt can be removed.

5. Hold VFU with one hand while removing mounting screws, and remove VFU with attached cable.

6, Replace VFU by reversing above steps. Adjust VFU (see Adjustment instructions below) and check operation.

ADJUSTMENT

1. Obtain correct VFU drive belt tension by rotating front of VFU up or down as required. Belt tension is correct when a pressure of 2 oz. (57 g) applied at middle of belt span will deflect belt 0.07 - 0.13 in. (1.8 - 3.3 mm). When belt tension is correct, tighten VFU adjust screw and VFU rear mounting screw.

2. Loosen detector assembly adjust screw.

3. Place a length of tape containing sprocket holes in the VFU tape reader.

4. Remove front Pedestal cover. Locate Test Point 1 (TP-1) on LOG board. Using at least a 20,000 OHM/VOLT voltmeter or oscilloscope, attach instrument lead to TP-1 (sprocket output) using ground as reference.

5. Turn Printer "On".

6. Move the VFU detector assembly toward front of Printer until the voltage peaks above +4 volts. Scribe or pencil a mark on the edge of VFU frame adjacent to front edge of detector assembly. Now move the detector assembly in the opposite direction until the voltage again peaks above +4 volts, and scribe or pencil another mark on the edge of VFU frame.

7. Finally, move the detector assembly so that its front edge is midway between the two scribe or pencil marks, and tighten the detector assembly adjust screw.

NOTE

If by moving the detector assembly in both directions and the voltage at TP-1 does not peak above +4 volts, the following may be necessary. Loosen the VFU adjust screw to provide slack in the VFU drive belt. Slip belt on pulley in the direction that causes the required voltage drop. Readjust belt per step 1 above.

8. Turn Printer "Off".

9. Remove instrument leads, and replace front Pedestal cover.

10. Check linefeed solenoid adjustment.

CAUTION

To assure error free operation of the VFU, it is extremely important that the linefeed solenoid arm in relation to the highest linefeed clutch lobe be within the specified tolerances — preferably at the bottom end of the range — 0.005 in. (0.13 mm).

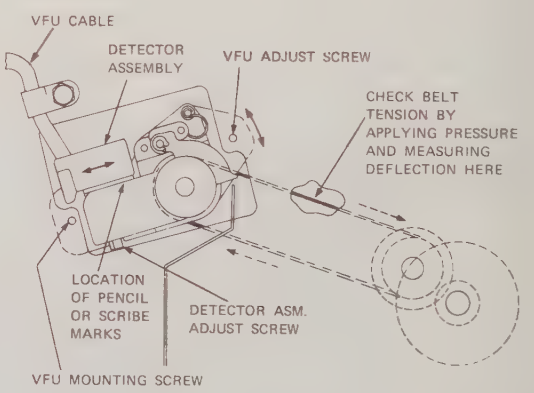
VFU CABLE
DETECTOR ASSEMBLY
VFU ADJUST SCREW
CHECK BELT TENSION BY APPLYING PRESSURE AND MEASURING DEFLECTION HERE
LOCATION OF PENCIL OR SCRIBE MARKS
DETECTOR ASM. ADJUST SCREW
VFU MOUNTING SCREW

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Figure 5-17. VFU Adjustment

11. To synchronize platen with VFU tape, turn Printer "On", and press FF pushbutton on control panel without paper installed in Printer. Install paper forms to be used with VFU tape, and advance to beginning of first form using platen knob.

BUSTLE ASSEMBLY
(Figure 5-5)

The instructions below are given with the assumption that the reader is facing the rear of the Pedestal unless specified otherwise.

1. Disconnect power plug from AC power source.

2. Remove front and rear Pedestal covers.

3. Loosen the four bustle cover screws at rear of bustle. Lift up and remove cover.

4. Remove the two ground wires secured with a hex head screw, star washer and nut from left side of Pedestal frame.

5. Remove AC power connector at top left of bustle.

6. Remove the three hex head screws along with star washers and flat washers securing the four cable clamps to bustle frame.

7. Remove bell connector.

8. Remove ground wire secured with a slotted screw, two star washers, and a nut from left side of Pedestal.

NOTE

The hammerbank, control panel, VFU, and photocell connectors each contain two small retaining screws which must be removed before the connectors can be removed.

9. Remove the four hammerbank connectors from center of Mother board.

10. Remove control panel connector from bottom right of Mother board.

11. Remove the photocell and VFU connectors from bottom left of Mother board. These connectors are keyed to avoid incorrect connector placement.

12. Remove single orange wire from right side of Mother board.

13. Remove the red and black wires from left side of Mother board.

14. Facing the front of the Pedestal, remove the four slotted screws securing bustle frame to Pedestal. Slide bustle out from rear of Pedestal.

CAUTION

When storing or working on bustle assembly, take necessary precautions to avoid damage to connecting pins on Mother board.

15. To replace bustle assembly, reverse steps 3 through 15 above.

CAUTION

All wires connected to the Mother board terminal tabs with sleeve type connectors must fit tight. If any are loose, the connectors should be closed up slightly to obtain a good fit with their mating terminals.

16. Connect power plug to AC power source, and check operation of Printer.

17. Replace Pedestal covers.

MULTIPLE VOLTAGE POWER SUPPLY
(Figure 5-18)

The following procedure for replacing the multiple voltage power supply will apply only to Printers having this option.

1. Disconnect power plug from AC power source.

2. Remove front and rear Pedestal covers.

3. Disconnect power cord at rear of Pedestal from AC connector at lower right corner (as viewed from rear) of Pedestal. Remove connector and ground wire from Pedestal frame.

4. Disconnect Printer power plug from 117V AC outlet on multiple voltage power supply.

5. Remove the four mounting screws securing the multiple voltage power supply to Pedestal and bustle frame.

6. Replace the multiple voltage power supply by reversing steps 3 through 5 above.

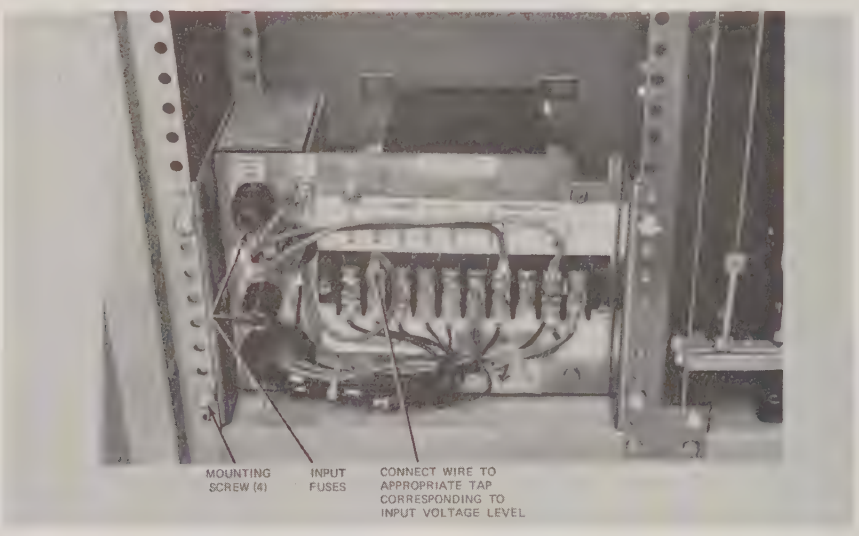
CAUTION

Make sure replacement power supply is correctly wired for the particular voltage level being supplied by the AC power source before connecting the power cord to the source.

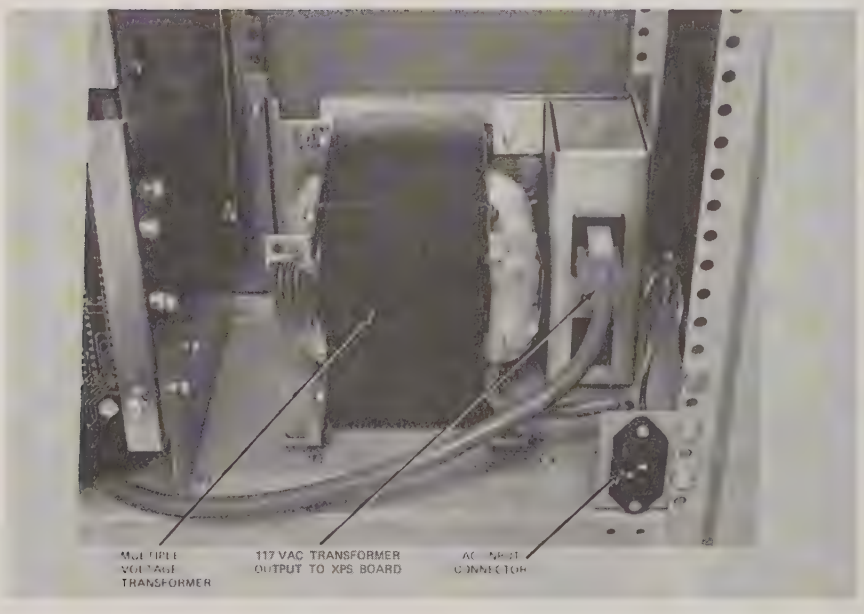
7. Connect power cord to AC power source.

8. Check operation of Printer.

9. Replace Pedestal covers.



Front View



REAR VIEW

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Figure 5-18. Multivoltage Power Supply.

BELL
(Figure 5-5)

1. Turn power "Off".

2. Remove front Pedestal cover.

3. Remove bell gong secured with a slotted screw.

4. Loosen bell assembly from Pedestal by removing the two mounting nuts and star washers.

5. Rotate bell assembly to expose two screw terminals on bottom. Remove the lead wires from terminals.

6. Replace bell by reversing steps 3 through 5 above.

7. Turn power "On", and check operation of bell.

8. Replace front Pedestal cover.

POWER SWITCH
(Figure 5-5)

1. Disconnect Printer from AC power source.

2. Remove front Pedestal cover.

3. Remove the two screws from front of switch housing.

4. Remove wires from switch and remove switch from housing.

5. Replace switch, connect wires to switch terminals, and replace housing with screws removed previously.

6. Connect Printer to AC power source and check switch operation.

7. Replace front Pedestal cover.

COOLING FANS
(Figure 5-19)

The entire family of TermiNet 340 Line Printers utilize a rear and a bottom cooling fan. Additionally, the TermiNet 340 Line Printer requires a front cooling fan to dissipate rapid heat build up caused by the high speed operation of the hammer bank coils.

It is particularly important when replacing any cooling fan that the replacement fan be oriented to achieve the correct air flow through the Printer and Pedestal as illustrated in Figure 5-19.

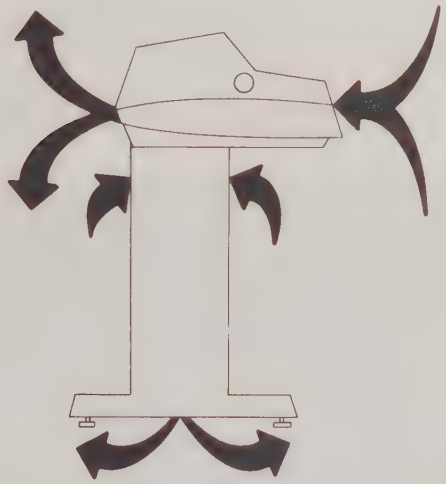

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Figure 5-19. Correct Cooling Air Flow

FRONT COOLING FAN
(Figure 5-20)

1. Raise top cover.

2. Remove control panel.

3. Remove wire leads from fan motor.

4. Remove four fan mounting screws and washers, and remove fan.

CAUTION

When replacing fan, orient fan so that direction of air flow is toward inside of Printer.

5. Secure fan with hardware previously removed.

6. Connect wire leads to fan motor.

7. Connect control panel cable and set control panel in place, but do not replace control panel hardware until later.

8. Use top cover interlock switch to turn power "On". Turn Printer "On", and check operation of fan.

9. Turn power "Off" with top cover interlock switch.

10. Replace control panel hardware previously removed.

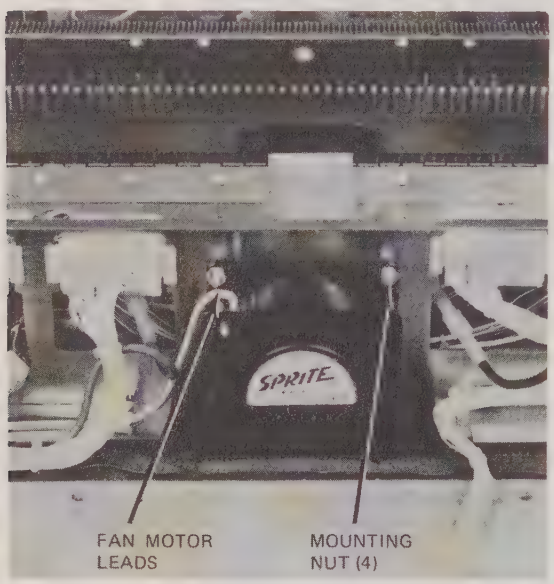

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Figure 5-20. Front Cooling Fan

REAR COOLING FAN (Figure 5-4)

1. Disconnect Printer from AC power source.

2. Raise top cover.

3. Remove power supply cover.

4. Remove fan leads from XPS board.

5. Remove the four screws, nuts and washers securing fan to rear frame, and remove fan.

CAUTION

When replacing fan, orient fan so that direction of air flow is toward outside of Printer.

6. Replace hardware previously removed to secure replacement fan.

7. Connect fan leads to XPS board.

8. Replace power supply cover and check operation of fan.

BOTTOM COOLING FAN

1. Turn power "Off".

2. Remove front and rear Pedestal covers.

3. Remove all bustle boards.

4. Remove bustle assembly from Pedestal.

5. Disconnect the two motor leads from the motor.

6. To remove the cooling fan from the bustle, remove the four nuts, star washers, and flat washers from the four hex head mounting screws.

CAUTION

When installing the replacement fan, make sure it is oriented to force air out at the bottom of the Pedestal.

7. Reverse steps 3 through 6 above.

8. Turn power "On" and check operation of fan. Verify that air is being exhausted from bottom of Pedestal.

9. Replace Pedestal covers.

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Figure 5-21. Bottom Cooling Fan.

COSMETIC SHIELD
(Figure 5-3)

1. Remove paper.

2. Open top cover.

3. Remove the two hex head mounting screws with star washers from each end of cosmetic shield, and slide shield up out of main frame.

4. Replace by reversing above procedure.

POWER SUPPLY
(Figure 5-22)

1. Disconnect Printer from AC power source.

2. Raise top cover.

3. Remove cosmetic shield.

4. Remove power supply cover.

5. Remove all connectors on XPS board.

6. Remove wire leads from motor start capacitor located on power supply.

7. Remove four power supply hex head mounting screws and lift power supply out of main frame.

8. Replace power supply by reversing steps 4 through 7.

NOTE

When replacing power supply, red motor lead goes to motor start capacitor terminal facing front of Printer.

9. Turn power "On", and check Printer operation.

10. Replace cosmetic shield and lower top cover.

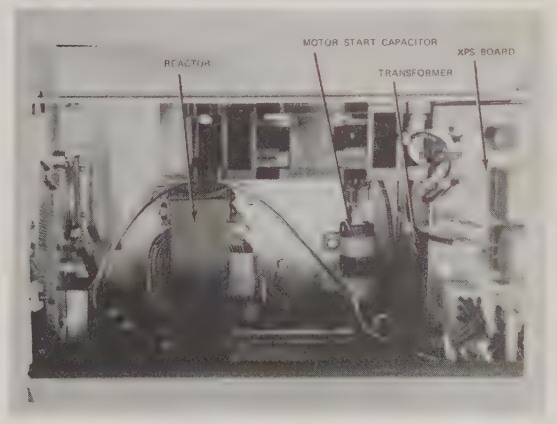

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Figure 5-22. Power Supply

MOTOR
(Figure 5-3)

1. Remove power supply.

2. Loosen the four Allen Head cap screws securing motor to right side frame.

3. Slide motor forward to allow removal of right drive belt.

4. Remove motor by removing the four motor mounting screws and lock washers.

CAUTION

When replacing motor, position motor so oil holes are on top.

5. With motor in place and correctly oriented, install the four Allen Head cap screws and lock washers, but do not tighten screws.

6. Install right drive belt and adjust to correct tension (see Table 5-3) by shifting motor position. When belt tension is correct, tighten motor mounting screws.

7. Replace power supply.

LEFT DRIVE BELT
(Figures 5-4 and 5-23)

1. Loosen the two screws holding small plate under left front of Printer. Remove plate (see Figure 5-25).

2. Reach up through access hole and slip belt off pulley under Hammer and Print Belt Assembly.

3. Open top cover and remove belt.

4. Loosen idler screw on top, rear idler.

5. Route replacement belt over pulleys as illustrated in decal on left side frame.

6. Reach up through access hole under Printer and slip belt over pulley under Hammer and Print Belt Assembly.

7. Adjust belt tension by moving top, rear idler up or down. Before proceeding to make final adjustment, first adjust for maximum belt tension. Belt tension is correct when a 4 ounce (114 g) downward pressure will deflect belt 0.1 to 0.30 inches (2.5 to 7.6 mm). When belt tension is correct, tighten idler screw.

8. Rotate print belt counterclockwise and check to make sure left idler pulleys are turning freely.

9. Replace access plate under Printer and close top cover.

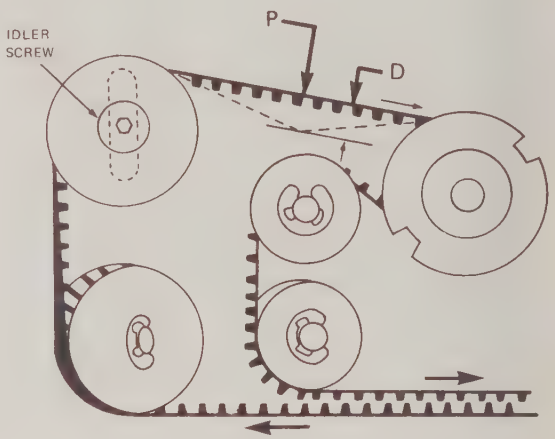

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Figure 5-23. Left Drive Belt Adjustment

HAMMER AND PRINT BELT ASSEMBLY
(Figures 5-3 and 5-26)

1. Raise top cover.

2. Remove ribbon cartridge.

3. Remove the five mounting screws from side frame on each end of Hammer and Print Belt Assembly.

CAUTION

DO NOT LOOSEN THE THREE SMALLER SCREWS SECURING ALIGNMENT BARS TO SIDE FRAMES. THE ADJUSTMENT OF ALIGNMENT BARS IS CRITICAL AND CAN ONLY BE DONE AT THE FACTORY.

4. Disconnect the four large connectors in front main frame. If special connector removal tool is not available, connectors can be loosened using only a screwdriver as follows:

a. Release connector lock by prying up on small tab located in top center of inside portion of connector.

b. Rest the screwdriver shank on top of front main frame with tip against lip on inside portion of connector. Gently tap along connector lip until the connector halves begin to separate, then pull connector apart (see Figure 5-24).

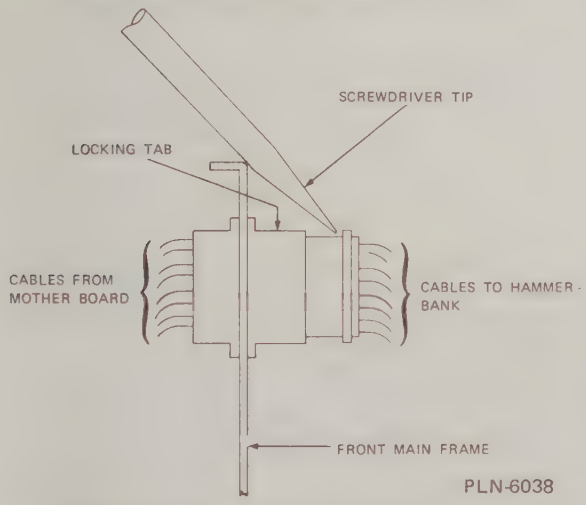

Figure 5-24. Hammerbank Connector Removal

5. Disconnect the four single hammerbank conductors — two black and two red.

6. Disconnect photocell cable. The connector is located in left, front main frame.

7. Remove access hole cover under left, front of Printer, and slip left drive belt off pulley under Hammer and Print Belt Assembly.

8. Lift Hammer and Print Belt Assembly straight up out of main frame.

CAUTION

DO NOT LOOSEN SCREWS SECURING ALIGNMENT BARS TO ENDS OF HAMMER AND PRINT BELT ASSEMBLY. THE ADJUSTMENT OF ALIGNMENT BARS IS CRITICAL AND CAN ONLY BE DONE AT THE FACTORY.

9. Before replacing Hammer and Print Belt Assembly, make sure toggle assembly is in upright position with small arm making contact with arm on RUN/LOAD lever.

10. Lower Hammer and Print Belt Assembly down into main frame until alignment bars on assembly are resting firmly against alignment bars on side frames.

11. Insert five mounting screws previously removed through side frames into each end of Hammer and Print Belt Assembly. Turn screws in, but, leave them loose.

12. Check mating of alignment bars on both sides through observation holes in side frames. If bars are not flat against each other, grasp each bottom, front corner of Printer and gently twist main frame by alternately lifting up on each corner. While doing this, observe alignment bars. When bars are correctly mated together, tighten the five mounting screws on each side of main frame.

Figure 5-25. Access Hole

13. Slip left drive belt over pulley under Hammer and Print Belt Assembly by reaching up through access hole under left, front of Printer.

14. Rejoin large hammerbank connectors. Check connector labels to assure correct mating of connectors.

NOTE

Hammerbank connectors are keyed to prevent erroneous connections. Additionally, the connectors contain identifying labels on their bottom side which can be read by slipping connectors out of their slots and turning them over.

15. Rejoin hammerbank single connectors, and photocell connector.

16. Replace ribbon cartridge and check operation.

17. Replace cover over access hole under left, front of Printer.

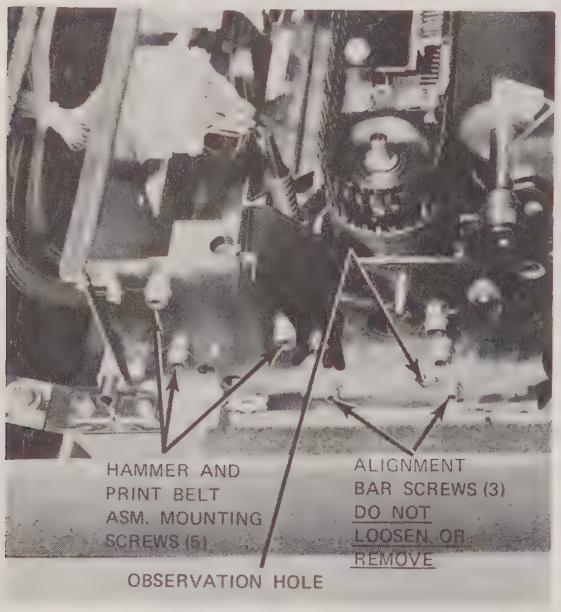

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Figure 5-26. Hammer and Print Belt Assembly Removal

REBOUND BELT
(Figure 5-29)

1. Open top cover.

2. Remove ribbon cartridge.

3. Grasp rebound belt near either print belt pulley and remove belt.

4. Replace rebound belt by working rib side of belt into groove in rebound bar, and stretching belt around print belt pulleys making sure belt rib is in pulley grooves. Visually inspect belt installation to make sure belt is not wrapped around any of the print fingers.

5. Rotate print belt counterclockwise a few revolutions to make sure rebound belt is correctly seated.

6. Replace ribbon cartridge.

7. Close top cover.

PAPER HOLDER
(Figure 5-33)

1. Open top cover.

2. Remove ribbon cartridge.

3. Remove Hammer and Print Belt Assembly.

4. Remove the six small screws and washers securing paper holder to belt guide. DO NOT loosen larger belt guide screws as this will destroy belt guide adjustment.

5. Replace paper holder using the six screws and washers previously removed.

6. Replace Hammer and Print Belt Assembly in Printer.

7. Replace ribbon cartridge.

8. Close top cover, and check operation.

PRINT BELT AND ADJUSTMENT OF MAGNETIC BELT GUIDE AND REBOUND BAR
(Figures 5-27 and 5-28)

PRINT BELT REPLACEMENT

1. Open top cover.

2. Remove ribbon cartridge.

3. Remove rebound belt.

4. Insert a 10-32 screw approximately 1½ or 2 inches in length through hole in right side frame and into threaded hole in tension support casting. Turn screw in until it moves tension arm assembly to its extreme left end of travel. This will take all tension off the print belt making its removal much easier.

5. Work the print belt up over both print belt pulleys until it is free.

6. Replace print belt by reversing steps 3, 4, and 5 above.

CAUTION

Make sure bottoms of print fingers are in slot in photocell assembly.

7. Rotate print belt counterclockwise a few revolutions to make sure there is no interference with the print fingers.

8. Replace ribbon cartridge.

9. Close top cover.

VERTICAL ADJUSTMENT OF MAGNETIC BELT GUIDE

In the unlikely event that light printing would occur at either the upper or lower portions of printed characters, after changing a print belt, the following procedure should be followed for adjusting the magnetic belt guide.

1. Open top cover.

2. Remove ribbon cartridge.

3. Remove Hammer and Print Belt Assembly.

4. Remove rebound belt and print belt.

5. Remove the large slotted screw on either end of the magnetic belt guide.

6. Lift up belt guide taking care not to misplace any of the shims located underneath.

7. To compensate for light printing, belt guide should be raised or lowered as follows:

a. When light printing at tops of characters occurs – lower belt guide.

b. When light printing at bottoms of characters occurs – raise belt guide.

The print belt is raised or lowered by adding or removing shims as required. In most cases, the belt guide will not require more than 0.005 in. (0.13 mm) adjustment to correct any printing deficiency. Shims are available in 0.003 inch (0.08 mm), 0.005 inch (0.13 mm), 0.007 inch (0.18 mm), or 0.010 inch (0.25 mm) sizes.

NOTE

When shim sizes are not known, a micrometer must be used to determine thickness of shims.

8. After making shim change under ends of belt guide, replace the two belt guide mounting screws, but do not tighten them as belt guide must be adjusted horizontally (see procedure below).

9. Remove both print belt pulleys. Remove nut and loosen set screw to remove left pulley, and remove grip ring to remove right pulley.

10. Make the same shim adjustment under both print belt pulleys as was done under belt guide.

11. Replace both print belt pulleys.

12. Use an alignment gauge to check vertical alignment of print belt pulley grooves with rebound bar and magnetic belt guide (see Figure 5-27).

13. Make horizontal adjustment on belt guide (see procedure below).

14. Replace print belt and rebound belt.

15. Replace Hammer and Print Belt Assembly.

16. Check tracking of rebound belt. If rebound belt tends to ride out of grooves in either the print belt pulleys or rebound bar when the pulleys are rotated, make a vertical adjustment to the rebound bar. This is done by removing the slotted screw from each end of the rebound bar and placing or removing shims underneath the bar.

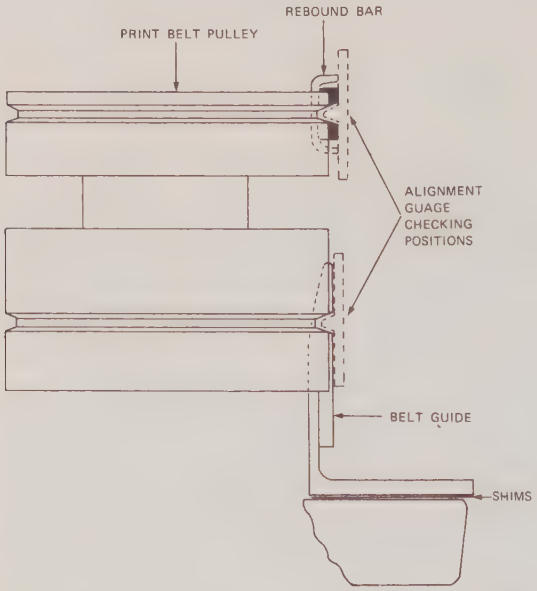
CAUTION

DO NOT LOOSEN ANY OTHER SCREWS ON TOP OF HAMMERBANK AS THESE WILL AFFECT A CRITICAL FACTORY ADJUSTMENT.

Before tightening the end rebound bar screws, make sure magnetic surface of rebound bar is 0.046 in. (1.17 mm) from outside crowned edge of print belt pulleys (right pulley in normal running position). Use same procedure as outlined below for horizontally adjusting magnetic belt guide.

17. Replace ribbon cartridge.

18. Install paper and check print quality.



PLH-6041

Figure 5-27. Alignment of Magnetic Belt Guide and Rebound Bar With Print Belt Pulleys

HORIZONTAL ADJUSTMENT OF MAGNETIC BELT GUIDE

1. Open top cover.

2. Remove ribbon cartridge.

3. Remove Hammer and Print Belt Assembly.

4. Insert a 10-32 x 1½ or 2 inch screw into the threaded hole in side of tension support casting. Turn screw in until it just makes contact with the tension arm assembly. This will hold right print belt pulley in its normal running position after print belt has been removed.

5. Remove rebound belt and print belt.

6. Loosen large slotted screw on either end of the belt guide.

7. Holding a straight edge against the right end of belt guide, move the belt guide until a clearance of 0.039 ± 0.003 inch (1.0 ± 0.08 mm) is obtained between outer surface of right print belt pulley and straight edge. Snug down right belt guide screw and repeat above procedure for left end of belt guide. When adjustment is complete, tighten down both belt guide screws and recheck clearance on each end.

8. Replace print belt and rebound belt.

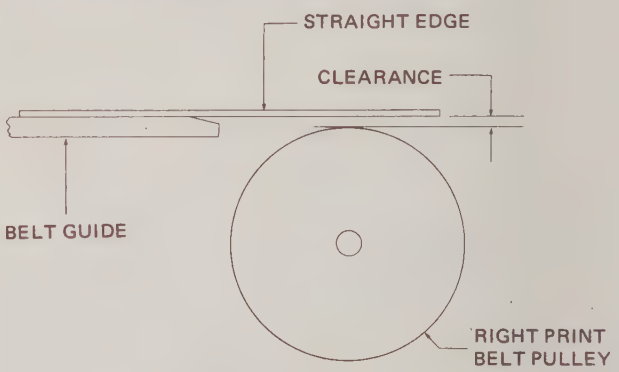
9. Remove 10-32 screw from side of tension support casting.

10. Rotate print belt counterclockwise a few revolutions and check for binding.

11. Replace Hammer and Print Belt Assembly.

12. Replace ribbon cartridge.

13. Close top cover.



PLH-6042

Figure 5-28. Magnetic Belt Guide Horizontal Adjustment

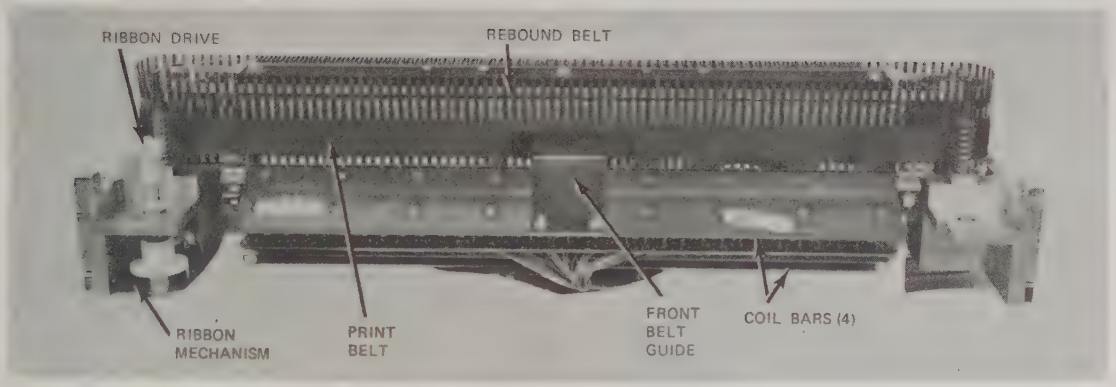
FRONT BELT GUIDE (Figure 5-29)

1. Open top cover.

2. Remove ribbon cartridge.

3. Remove the two front guide mounting screws and remove guide.

4. When guide has been replaced, adjust for a clearance of 0.050-0.070 inch (1.3-1.8 mm) between guide and print belt.



PLH-6099

Figure 5-29. Hammer and Print Belt Assembly (Front View)

RIBBON DRIVE ASSEMBLY
(Figure 5-30)

1. Remove Hammer and Print Belt Assembly from Printer.

2. Remove the three mounting screws from the plate under left side of Hammer and Print Belt Assembly. Remove this plate containing three ribbon drive gears. Any one or all of the gears on plate assembly can easily be replaced by removing E rings from gear posts.

3. Slide gear clutch off ribbon drive shaft.

4. Remove the two lower E rings from drive shaft, and pull shaft up out of drive support casting.

5. Drive spring can be replaced by removing upper E ring and shoulder washer on drive shaft assembly.

6. The drive coupling can be replaced by pushing out dowel pin holding coupling to shaft.

7. Before reassembling ribbon drive assembly, inspect condition of the two ribbon drive shaft bushings. One bushing is located in drive support casting and the other one is located on plate assembly. If the bushings show evidence of excessive wear, they can be replaced by removing them with a bearing puller. Before replacement bushings are installed, coat outside of bushing with Loctite solution. Bushings can then be installed by simply pushing them in place using finger pressure.

8. Install ribbon drive shaft containing drive coupling, dowel pin, spring, shoulder washer and upper E ring in drive support casting.

9. Place the two lower E rings on drive shaft.

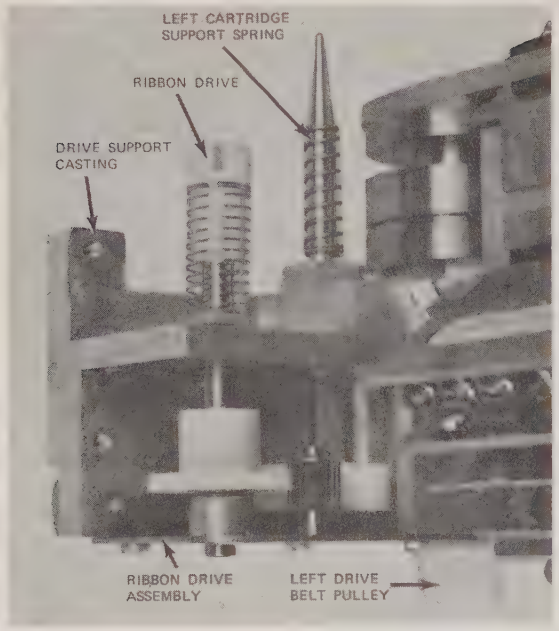
10. Push gear clutch assembly onto drive shaft with gear end down.

11. Before reinstalling plate assembly with attached gears, inspect gear pulley for wear or damaged teeth. If gear pulley needs replacement, the entire pulley shaft with attached gear pulley must be replaced. (See instructions for replacing left pulley shaft assembly).

12. Carefully position plate and gears assuring that gears on plate properly mesh with gear pulley and gear clutch assembly. Secure plate to Hammer and Print Belt Assembly with the three screws previously removed.

13. Check operation by rotating left print belt pulley (as viewed from top of pulley) in counterclockwise direction. Drive coupling should also rotate smoothly in the same direction. Next, rotate left print belt pulley in the clockwise direction while holding drive coupling stationary. Clutch action should be such that no torque is felt on drive coupling while print belt pulley is rotated clockwise.

14. Replace Hammer and Print Belt Assembly in Printer.



PLH-6100

Figure 5-30. Ribbon Drive Assembly

LEFT PULLEY SHAFT ASSEMBLY (Figures 5-3 and 5-31)

1. Remove Hammer and Print Belt Assembly from Printer.

2. Remove traveling rebound belt and print belt.

3. Remove the three screws securing the plate under pulley support casting on left side of Hammer and Print Belt Assembly, and remove plate with attached gears.

4. Grasping left print belt pulley, remove nut from top of pulley shaft.

5. Loosen Allen Head set screw in side of pulley and remove pulley from shaft.

6. Remove all shims from top of pulley shaft.

CAUTION

Do not misplace shims — they must be replaced when reinstalling shaft assembly.

7. Pull pulley shaft out from bottom until E ring on shaft is against top surface of bottom bearing. Firmly grasp shaft assembly by holding gear pulley. The bottom bearing can be worked out of the drive support casting by moving pulley shaft back and forth while pulling outward on shaft assembly. When bearing is worked free, pulley shaft assembly will come out of casting. Bearing can be removed from shaft assembly by removing E ring on shaft.

8. Top bearing can be removed by removing the two retaining screws from top of drive support casting and gently tapping bearing out with a slender, blunt-edged tool extended through casting from bottom side.

9. Before replacing pulley shaft assembly, slide bottom bearing on shaft and place E ring on shaft above bearing.

10. Gently press top bearing into top of drive support casting and replace the two retaining screws previously removed.

11. Insert pulley shaft through bottom of drive support casting, and gently press bottom bearing into casting.

12. Replace all of the shims previously removed over top of shaft.

13. Place print belt pulley on shaft keeping set screw lined up with flat side of shaft. Tighten pulley set screw.

14. Replace nut on top of shaft over pulley.

15. Replace plate with attached ribbon gears to bottom side of drive support casting.

16. Replace print belt and traveling rebound belt.

17. Rotate print belt in a counterclockwise direction to check for binding in any of the moving parts.

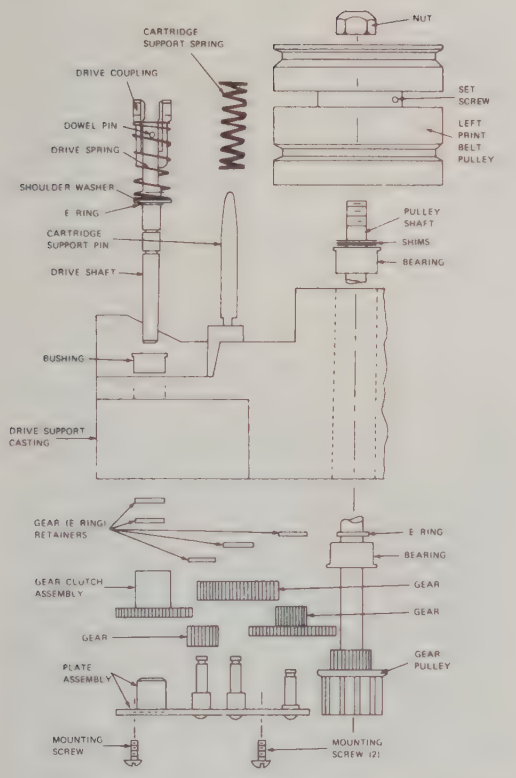
18. Reinstall Hammer and Print Belt Assembly into Printer.

RIGHT PULLEY ASSEMBLY (Figures 5-3 and 5-32)

1. Open top cover.

2. Remove ribbon cartridge.

3. Remove traveling rebound belt and print belt.



PLH-6044

Figure 5-31. Left Pulley Shaft and Ribbon Drive Assemblies

4. Remove grip ring and spring washer from right pulley shaft, and slide pulley off shaft.

CAUTION

Make sure any removed shims are replaced on shaft before pulley is replaced.

5. Bearings in pulley are easily removed as follows:

a. Place pulley in upright position on a work surface.

b. Extend a slender, blunt-edged tool through top of pulley at a slight angle to make contact with top surface of bottom bearing. Gently tap tool while moving tool in a circular direction around rim of bearing until bearing drops out of pulley.

c. Turn pulley over and repeat above procedure to remove top bearing.

6. Replace bearings in pulley by pushing them in place using finger pressure.

7. The belt tension spring can be removed by compressing it enough to allow it to slip out between the tension support casting and arm assembly. The spring can be replaced by reversing the above procedure.

8. Slide pulley onto pulley shaft.

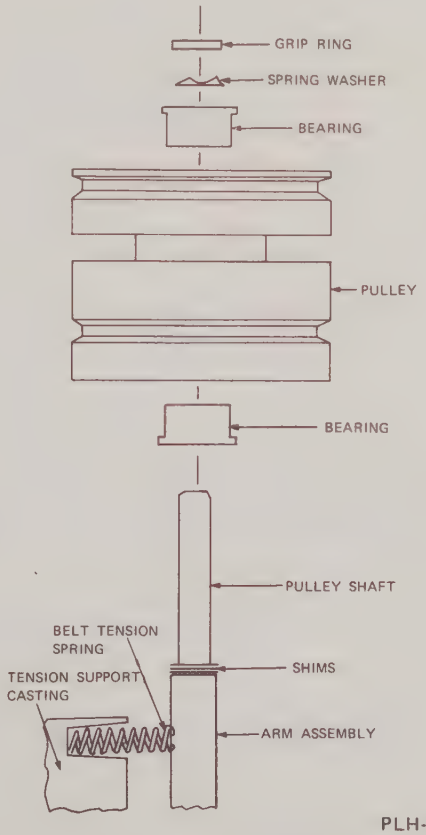
9. Place spring washer over top of shaft.

10. Push grip ring onto shaft against spring washer. Make sure grip ring is pushed down far enough to remove all vertical play in pulley.

11. Rotate pulley to make sure there is no binding.

12. Replace print belt and rebound belt.

13. Install ribbon cartridge.



PLH-6045

Figure 5-32. Right Pulley Assembly

RIBBON CARTRIDGE SUPPORT SPRINGS (Figure 5-30)

There are two ribbon cartridge support springs located on the Hammer and Print Belt Assembly — one on the left side and one on the right side. These

springs fit over the cartridge support pins and can be replaced as follows:

NOTE

Replace both springs as a set when one spring requires replacement.

1. Open top cover.

2. Remove ribbon cartridge.

3. Pry tang on bottom end of spring up over shoulder at bottom of pin, and slide spring off pin.

4. When replacing spring, push tang end of spring over pin first so that tang will lock spring to pin by fitting over shoulder at bottom of pin.

CAUTION

Top part of spring must compress freely over pin.

5. Replace ribbon cartridge.

PHOTOCELL ASSEMBLY
(Figure 5-33)

1. Raise top cover.

2. Remove ribbon cartridge.

3. Remove rebound belt and print belt.

4. Remove toggle assembly.

5. Remove access cover under front left side of Printer.

6. Loosen photocell connector at front of main frame.

7. Remove small Allen Head screws from top and left end of photocell assembly. Also, remove spring from left end of assembly.

8. Pull cable (attached to photocell assembly) through space below hammerbank.

9. To replace the photocell assembly, push cable under hammerbank until the connector can be grasped by reaching up through the access hole under Printer. The cable can then be guided on through under hammerbank until the end reaches the connector at front of main frame. Connect photocell cable.

10. Set photocell assembly on positioning pins on top of pulley casting.

11. Start Allen Head adjustment screw through hole in left side of pulley casting. When threaded end of screw starts showing through hole, place one end of spring over end of screw. Push spring down into cavity on top of photocell assembly, and finish pushing screw through hole and spring. With Allen Head wrench of correct size, turn screw in until threads properly engage small nut in photocell assembly.

12. Insert top Allen Head screw through elongated hole in photocell assembly. Turn in screw until head is almost down on top of photocell assembly.

13. As a preliminary adjustment, turn adjustment screw at left until top screw is centered with respect to elongated hole. Tighten top screw.

14. Replace access cover, paper tensioner, print belt, rebound belt, and ribbon cartridge.

PHOTOCELL ADJUSTMENT

Make the final adjustment of the photocell as follows:

1. Print two lines of random characters. Remove the ribbon cartridge.

2. Place a timing gauge (44A410619-G01), over hammers on left end of hammerbank by placing slots on underside of gauge over the hammers. The top part of gauge must be over printed characters on paper.

3. Check centering of characters appearing between hairlines on gauge. If characters are consistently to right or left of the distance between hairlines, adjust photocell timing as follows:

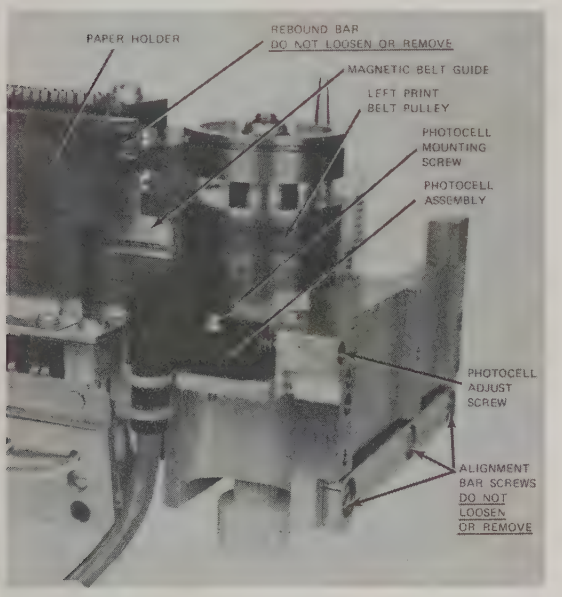
a. Loosen top Allen Head screw on photocell assembly and turn adjustment screw as required.

b. If characters between hairlines are too far to left, turn adjustment screw counterclockwise.

c. If characters between hairlines are too far to right, turn screw clockwise.

d. Tighten top screw on photocell assembly.

4. Replace ribbon cartridge and recheck timing.



PLH-6101

Figure 5-33. Hammer and Print Belt Assembly — Left End.

RIGHT DRIVE BELT
(Figure 5-3)

1. Raise top cover.

2. Loosen the four Allen Head cap screws securing motor to right side frame.

3. Slide motor forward enough to allow removal of belt.

4. Slip replacement belt over motor and right jackshaft pulley.

5. First, slide motor toward rear of Printer until maximum belt tension is obtained. Then proceed to adjust motor position for correct belt tension, and tighten the four motor mounting screws. Belt tension is correct when a force of 4 oz. (114 g) applied to the center belt span between pulleys deflects the belt 0.1 to 0.175 inch (2.5 to 4.4 mm).

6. Lower top cover.

JACKSHAFT AND LINEFEED CLUTCH
(Figures 5-34 and 5-35)

1. Disconnect Printer from AC power source.

2. Remove paper.

3. Open top cover.

4. Remove power supply cover.

5. Remove cosmetic shield.

6. Remove platen.

7. Loosen motor mounting screws and shift motor forward to allow removal of right drive belt.

8. Remove plate over access hole under left, front of Printer.

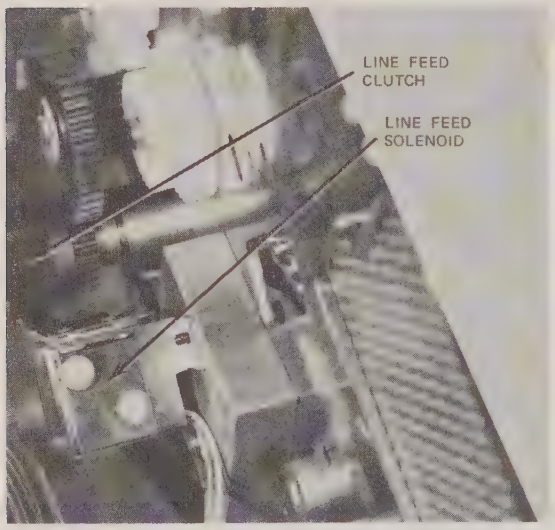
9. Reach up through access hole to remove left drive belt from pulley under Hammer and Print Belt Assembly and slip belt off left jackshaft pulley assembly.

10. Loosen both Allen Head set screws in right jackshaft pulley and remove pulley.

11. Loosen both Allen Head set screws in left jackshaft pulley assembly and remove assembly.

NOTE

The left jackshaft pulley assembly contains a unique coupling device which will prevent the Printer from losing speed in the event of a power interruption for a duration of up to one cycle (6.7 msec.).



PLH-6103

Figure 5-34. Linefeed Clutch

12. Loosen Allen Head set screw in linefeed clutch.

13. Push out small round plug in right side of bottom cover adjacent to right end of jackshaft.

14. While holding linefeed clutch with one hand, pull jackshaft to right through access hole in bottom cover (see Figure 5-3) until jackshaft is completely removed from Printer.

15. Remove linefeed clutch by sliding anti-backlash spring off left bearing housing.

16. To replace jackshaft, slide shaft through access hole in bottom cover and part of the way through right jackshaft bearing. End containing cutout for clutch set screw must go in first. Leave room to place clutch over left end of jackshaft.

CAUTION

Tang end of antibacklash spring must be facing left.

17. With clutch on jackshaft, slide jackshaft to left through left jackshaft bearing.

18. Position clutch so that tang end of antibacklash spring is placed over end of left jackshaft bearing housing.

19. Position jackshaft so that clutch set screw is centered over groove in shaft. Tighten clutch set screw.

20. With clutch set screw tight, slide jackshaft to left as far as possible.

21. Slide left jackshaft pulley assembly over left end of shaft.

22. Place a 0.006 inch (0.15 mm) feeler gauge between outside edge of left jackshaft bearing and left pulley assembly. Push pulley assembly tight against feeler gauge and tighten both Allen Head set screws in pulley assembly. Remove feeler gauge. Check jackshaft end play which should be 0.003-0.008 inch (0.08-0.20 mm).

23. Slide right jackshaft pulley over right end of jackshaft keeping end of shaft flush to 0.06 inch (1.5 mm) beyond outside edge of pulley. Tighten both Allen Head set screws in pulley.

24. Reinstall left drive belt.

25. Reinstall right drive belt and adjust for correct belt tension.

26. Rotate print belt counterclockwise a few revolutions to check for binding.

27. Replace round plug in right side of bottom cover.

28. Replace plate over access hole under left, front of Printer.

29. Check adjustment of linefeed solenoid. Solenoid actuating arm should clear highest clutch lobe by 0.005-0.010 inch (0.13-0.25 mm) with arm in energized position (see Figure 5-36).

30. Lubricate gear teeth on clutch gear and on mating gear with "Lubriplate* #630-AA, ME-D6A3."

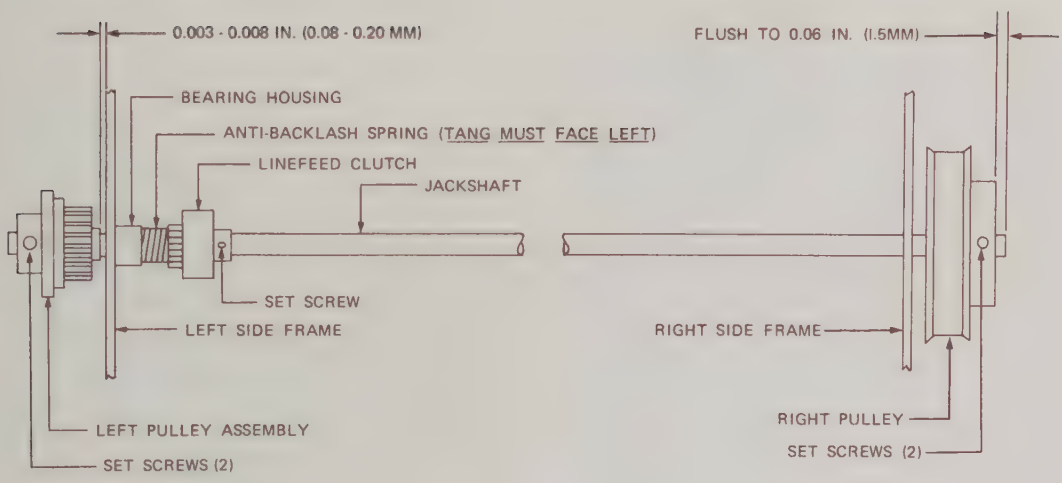
31. Replace platen, cosmetic shield, and power supply cover.

32. Close top cover and install paper.

33. Connect Printer to AC power source and check operation.

NOTE

Test pattern used with built-in test circuit on Printer is an excellent check for correct linefeed clutch operation.



PLH-6040

Figure 5-35. Jackshaft Adjustment

JACKSHAFT BEARINGS

1. Remove jackshaft and linefeed clutch.

2. Using a bearing puller, remove right jackshaft bearing.

3. Insert a long, slender, blunt-edged tool into inboard side of left jackshaft bearing housing. Gently tap end of tool until bearing drops out of housing.

4. Coat outside surface of replacement bearings with Loctite* solution and press them into place (flange end facing out) using finger pressure. Allow sufficient drying time as stated on the Loctite container.

CAUTION

Left and right jackshaft bearings are not interchangeable — the left bearing is longer than the right one.

*Registered Trademark of Loctite Corporation

5. Replace jackshaft and linefeed clutch.

LINEFEED SOLENOID
(Figures 5-34 and 5-36)

REPLACEMENT

1. Disconnect Printer from AC power source.

2. Open top cover.

3. Remove power supply cover.

4. Remove cosmetic shield.

5. Remove platen.

6. Disconnect linefeed solenoid cable from XPS board. Cut cable tie securing solenoid cable to transformer cables.

7. Holding linefeed solenoid with one hand, remove the two Allen Head cap screws and one flat washer supporting solenoid assembly to left

main frame. Remove solenoid with attached mounting block from Printer.

8. Remove the two slotted screws securing solenoid to solenoid mounting block and take solenoid off block.

9. Replace solenoid by reversing steps 6, 7, and 8 above. Make sure solenoid cable is dressed away from moving parts of Printer.

10. Adjust solenoid position (see Adjust Procedure below).

WARNING

When power is "On" with top cover raised and power supply cover removed, DO NOT TOUCH ANYTHING IN THE POWER SUPPLY AREA.

11. Connect Printer to AC power source and turn Printer "On" using the top cover interlock switch.

12. Press the LINEFEED pushbutton on control panel several times while visually checking solenoid operation.

13. Disconnect Printer from AC power source.

14. Replace platen, cosmetic shield, and power supply cover.

15. Close top cover and connect Printer to AC power source.

ADJUSTMENT (Figure 5-36)

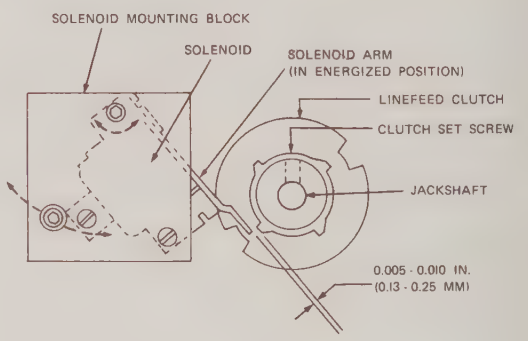
1. Rotate jackshaft by hand until a clutch lobe is lined up with edge of solenoid arm.

2. With solenoid arm in the energized position, rotate solenoid assembly until a 0.005-0.010 inch (0.13 - 0.25 mm) clearance is obtained between solenoid arm and highest clutch lobe. Use a feeler gauge to check clearance.

CAUTION

To assure error free operation of the VFU (if employed), it is extremely important that the above clearance be within the specified tolerances – preferably at the bottom end of the range – 0.005 inch (0.13 mm).

3. When solenoid is correctly adjusted, tighten the two Allen Head cap screws securing solenoid assembly to left side frame.



PLH-6039

Figure 5-36. Linefeed Solenoid Adjustment

PLATEN DRIVE GEARS (Figure 5-37)

1. Disconnect Printer from AC power source.

2. Remove paper and open top cover.

3. Remove power supply cover, cosmetic shield, and platen.

4. Remove access cover under left front of Printer and slide left drive belt off pulley under Hammer and Print Belt Assembly.

5. Remove left jackshaft pulley assembly and slide jackshaft to right until linefeed clutch is out of the way.

6. Remove E ring from the three gear posts on inside of left side frame.

7. Pull gears off posts.

8. The tractor driving gear located on the outside of left main frame can also be removed by removing the E ring on gear post and sliding gear off post.

9. Before replacing gears, lubricate all gear posts with SAE 10w-20w-30 motor oil. After gears are secured on gear posts, lubricate all gear teeth with Lubriplate #630-AA, MED6A3.

10. Slide jackshaft and linefeed clutch in place and replace left jackshaft pulley assembly. Install left drive belt.

11. Adjust jackshaft for 0.003-0.008 inch (0.08-0.20 mm) end play.

12. Connect Printer to AC power source and turn Printer "On".

WARNING

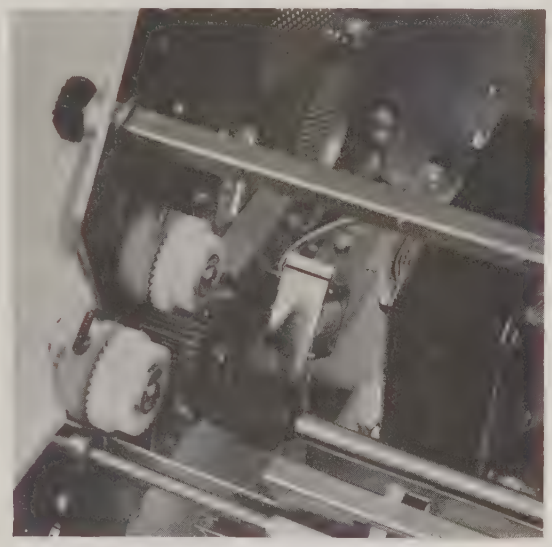
DO NOT TOUCH ANYTHING IN THE POWER SUPPLY AREA WHILE TOP COVER IS RAISED WITH POWER ON.

13. Check gear operation by executing several linefeeds in succession.

14. Disconnect Printer from AC power source.

15. Replace platen, cosmetic shield, access cover under left, front of Printer, and power supply cover.

16. Lower top cover and connect Printer to AC power source.



PLH-6104

Figure 5-37. Platen Drive Gears

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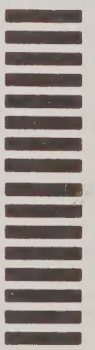

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